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CHART OF THE HEAVENS SHOWING THE CONSTELLATIONS IN THE NORTHERN AND SOUTHERN HEMISPHERES.

THE

STOREHOUSE

OF

GENERAL INFORMATION.

CASTRO—DEODAR.

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* The Editor is also indebted to Mr. Cutler for his kindness in revising several of the legal articles in earlier portions of the work.

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Castro, JUAN DE, born at Lisbon in 1500, and connected by family ties with the Portuguese throne, was educated with the Infante Luis, and began his career at Tangiers when only eighteen. In 1535 he served at the siege of Tunis, and about 1539 went out to Goa, where he distinguished himself in various expeditions. In 1543, having returned to Portugal, he was entrusted with a fleet to suppress piracy in the Mediterranean, and in 1545 he was again sent to India. He now performed a series of brilliant exploits, defeating Mahmoud, King of Cambodia, relieving the siege of Diu, overthrowing Abdul Khan, capturing Broach and Malacca, and effecting a passage into Ceylon. So popular was he that the merchants of Goa willingly raised a large loan on the security of his moustache. He was appointed viceroy in 1547, but died next year in the arms of his friend, St. Francis Xavier. His sons were also brave and capable explorers.

Castro, VACA DE, born at Leon in Spain early in the sixteenth century, became judge at Valladolid, and in 1540 was sent by Charles V. to take over the governorship of Peru, then a prey to the factious movements of Pizarro and Almagro. On his arrival he found that the former had been assassinated by the latter, whom he defeated and beheaded in 1542. He then set about improving the condition of the native population, and was at once therefore looked upon with suspicion by his countrymen. Recalled in 1544, he spent a long period in prison, dying in 1558.

Castro Giovanni (anc. *Enna*), a town in the province of Catania, Sicily, and near the railway between Catania and Girgenti, stands on a lofty and fertile plateau 4,000 feet above sea-level, the position being nearly impregnable. According to some accounts the place was established as a colony from Syracuse in the seventh century B.C., but its fame reaches back into the mythical past, for here Ceres was believed to have been born, and close by is the lake of Pergusa, whence Pluto carried Proserpine away. From the tyrants of Syracuse it passed first to the Carthaginians and then to the Romans. The Saracens held it from 850 to 1080, and have left some architectural traces. They were followed by the Normans, whose fair hair and blue eyes may be still recognised among the dark-skinned Sicilians. The site of the famous temple of Ceres is now filled by the ruins of a castle built by Ferdinand II. of Aragon. The name is simply a corruption of Castrum Ennæ.

Castro del Rio, a town in the province of Cordova, Spain, and 16 miles S.E. of the city of that name, is situated near the river Guadajocillo. It has a fine town-hall, several churches and convents, etc., and the remains of ancient walls. There is a considerable trade in agricultural products, and coarse woollen and linen goods are made for local use.

Castro Villari, a fortified town in the province of Calabria Citra, Italy, 7 miles from Cassano. It stands on a height surrounded by lofty mountains, and possesses a massive Norman keep. The modern streets are well laid out. There is a considerable trade in wine, silk, cotton, fruits, and manure. At Monte Pollino, in the vicinity, a famous cheese is made.

Cast Steel. [IRON.]

Casuariidæ. [CASSOWARY.]

Casuistry, a kind of ecclesiastical case-law, which, by precedent and principle, declares the moral nature and value of an action with reference to a certain theological standard. The employment of casuistry has arisen out of the difference made between mortal and venial sin, the fact of a certain action being in the one category or the other depending upon a number of conditions, such as motive, opportunities of knowledge, or the like. The standards upon which the system of casuistry is based are Scripture, reason, the canons of the Church, and the opinion of eminent theologians. It is said to have originated with St. Raymond in 1228, and has been greatly developed since that time, culminating, perhaps, in the last century with St. Alfonso Liguori. But it is by no means confined to the Roman Church. The Jews had a system of casuistry in the Talmud. It is mentioned in the New Testament *apropos* of oaths by the altar or the gift on the altar; and in the Old Testament, when Naaman asks pardon beforehand for bowing himself in the house of Rimmon when in attendance upon his master, and the prophet bids him "go in peace," the principle of casuistry was certainly applied. It is a system well known to English law, and the satirical supposed case of the "black and white horses" was an application of it.

Casus Belli may be described as the last political straw that breaks the camel's back, and may consist of any act on the part of one nation towards another which forms the pretext for a war. Sometimes it is a well-understood step, at others the veriest trifle may determine a war. In the war between England and America in 1812 a claimed right of search, in the Crimean question the crossing of a river, in the Franco-German war a slight to an ambassador, formed the pretext.

Cat, the book-name of any species of the Felidæ, of the group Æluroidea, of the order Carnivora. The family contains but one living genus—or, at most, two genera—and includes the typical carnivora. The lion, tiger, leopard, puma, jaguar, ounce, cheetah, and clouded tiger (all which see), are often called the large cats; and there are a number of smaller forms, to many of which the name "cat," with some distinguishing epithet, is applied. [CARACAL, OCELOT, SERVAL, TIGER-CAT.] Another division, distinguished by pencilled ears, may also be marked off from the main group. [LYNX.] The members of this family, widely distributed in both hemispheres, are specially fitted for a life of rapine; every part of the ordinary mammalian structure is organised for capturing, killing, and devouring living prey. Externally, these animals may be recognised by their lithe, agile form, small rounded head, well-proportioned, muscular limbs, close adpressed fur, stealthy movements, and keen eager glance—all necessary for their predaceous mode of life. Anatomically, the chief characters are their strong claws—retractile in all but the cheetah, their carnassial teeth [CARNIVORA], the rounded skull, and the division of the auditory bullæ into two parts by a bony partition. The tongue is furnished with little horny spines, used to rasp the flesh of their prey from the bones. In some forms, as in the domestic cat, the pupil of the eye is round only in the dark, when it is dilated to receive every available ray of light, but in the daytime it is contracted to a mere slit. "Wild cat" is a name given to several of the smaller cats of Asia and Africa, and sometimes to a feral race of *Felis domestica*, escaped from domestication. But the term is pre-eminently applied to *F. catus*, now confined to Southern Russia and the adjacent parts of Asia, Greece, Turkey, Central Europe, and Scotland. It has long been extinct in England, and probably never existed in Ireland, though there feral cats are of frequent occurrence, as in England. This animal is more strongly built than the domestic cat, and has a shorter tail, of uniform thickness, ringed with black and black at the tip. In general appearance it may be described as "a miniature tabby tiger." One killed at Cawdor Castle measured 45 in. over all. It is a solitary nocturnal animal, preying on birds, and small mammals, especially rabbits, and killing far more than it can eat; its disposition is very savage, and it has been known to attack man.

The domestic cat (*F. domestica*) is quite a distinct species, probably descended from the Egyptian cat (*F. maniculata*), which was certainly domesticated more than 3,000 years ago, and worshipped in some cities and embalmed after death. The strain, however, is decidedly mixed, for the cat was domesticated in Europe more than 2.000 years ago, and there is little doubt that the Crusaders brought a distinct race with them from the East. The Jews must have been acquainted with the cat, but there is no reference to it in the Authorised Version, though it is mentioned in Baruch vi. 22. The great value set on these animals as mousers in the Middle Ages, is shown by the laws enacted for their preservation, and the severe fines inflicted on those who killed one. By a law of Howel the Good, a Welsh prince of the tenth century, anyone who stole or killed the cat which guarded the royal granary was to forfeit a ewe with its fleece and lamb, or as much wheat as would form a pile sufficient to cover the cat when held up by the tail with its nose touching the ground. The domestic cat runs into many varieties, chiefly of colour and fur. According to Dr. Mivart these are: (1) Black, with clear yellow eyes, and a few white hairs on the throat. The young show decided stripes or spots, especially on the limbs; (2) White, often with blue eyes, which are generally correlated with deafness; (3) Tabby—grey striped and mottled with black—probably the result of crossing with the wild cat; (4) Tortoiseshell, fawn mottled with black, generally females, though one good instance of a male is on record; (5) Grey, striped only over the fore legs; (6) Sandy, usually males. The Persian cat is remarkable for its size, and the length and fineness of its fur; the Siam cat is uniform fawn, with a dark muzzle; the Carthusian cat is uniform slate-grey, called "blue" by fanciers; the Manx and Crimean cats are tailless, but tailed specimens also exist in Man. Manx cats are sometimes called kangaroo cats, from the fact that the hind limbs are longer than the fore. There was said to be a breed with pendent ears in China, but Père David has shown this story to be without foundation. It is on record that a domestic cat has attained a weight of 23 lbs., but this is far above the average. About twelve years is the ordinary life limit, but 18 years have been reached, and there are many cases of intermediate periods. The habits of the cat are far too well known to need description. With domestication, however, they have acquired a fondness for articles of diet they could never obtain in a wild condition—cheese, fish, and milk. They sometimes develop a taste for sweet things, and the writer once had a cat with a strain of Persian blood that was extremely fond of melon. The sexual passions of the cat are very strong, and the cry of the sexes to each other is so ear-piercing as to have given rise to the verb "to caterwaul."

The cat is kept chiefly as a mouser, and it is estimated that one cat will destroy about twenty mice a day. But cats also act as preventives, and their mere presence will do much to rid a house of rodent plagues. Apart from its value as a mouser, the cat is often kept as a pet, and it is the fashion to decry its affection and intelligence as compared with the development of those qualities in the dog. Those who do so have never taken the trouble to win the confidence of a cat, which is not an ardent, but a very constant lover. Whoever has

done so, however, will have abundant reward for his pains. He will soon discover that the cat is not a whit behind the dog in intelligence, and its affection should be more valued because it is not lavished indiscriminately. The literature of the domestic cat is not voluminous. Mrs. Cashel Hoey's translation of Champfleury is a good book; but Pierre Loti's sketch *Vies de deux chattes* is the work of a true lover of cats, and should be read by all who doubt their intelligence and affection. Cats have suffered grievous things at the hands of animal painters. It is the fashion to depict them in human attitudes and occupations, and it is sad to see how plentiful these productions are in printsellers' windows. There is only one living artist—Mdme. Ronner—who can paint a cat, and the pictures just alluded to bear about the same relation to her work as do the fencing frogs and cricketing squirrels that one sees in country "stuffers'" windows to the admirable reproductions of bird-life in the galleries at South Kensington. [WITCH.]

Cataclysm, an inundation or deluge, which in the Stoic cosmogony (based upon that of the Egyptians and resembling that of the early Brahminical writings) was believed to destroy the world alternately with the *ekpyrosis*, or destruction by fire. The belief in the necessity of such sudden and universal convulsions to explain geological phenomena was not abandoned until Lyell in the present century had enforced the uniformitarian teaching of Hutton and Playfair.

Catacombs, from Gk. *kata* and *kumbe* (c.f. *combe*, denoting a hollow, as Ilfracombe, Pyecombe, etc.), used to denote subterranean galleries such as are found beneath Paris and in the neighbourhood of Rome. It is these latter which are *par excellence* usually spoken of as *The Catacombs*. Of these there are some forty around Rome. They may be generally described as underground cemeteries, worked in the volcanic soil, which is sufficiently soft to be easy of excavation and yet hard enough to support the overlying soil. The Christians seem at an early period to have utilised these burial-places not only as burial vaults, but as places to carry on their forbidden worship. A decree of the Emperor Valerian in 253 forbade the Christians to assemble in their cemeteries. This edict was in the next year revoked, but in the third century the cemeteries were confiscated, though they were afterwards restored. But before the end of the fifth century the practice of burial in them had been generally abandoned. They had in the latter part of this period been greatly beautified by sculpture and other ornamentation, and the fact that they were ransacked by the Goths in 557, and at a later date by the Lombards in 756, shows that a mysterious and exaggerated value had been attributed to their contents by tradition. After this they appear to have been neglected and to have well-nigh passed out of remembrance until a landslip in 1578 brought them once more to public notice. They were explored, and in 1632 Antonio Bosio published an account of them which still remains in many respects an authority. But the best work upon them is that of De Rossi (1864–77), which has established a chronological arrangement and shows the progress of Christian art as exhibited in the catacombs from the earliest period. The earliest and most simple mode of burial was to place a slab before the niche containing the body —the slab sometimes being a Pagan slab with Pagan symbols or inscription reversed—and to put upon it the name of the dead accompanied by some prayer or pious wish. In connection with some tombs vessels with the remains of a red fluid have been found. This was formerly supposed to be blood and to mark the resting-place of martyrs, but later opinions are that it was wine, sacramental or other. The early inscriptions were often half Pagan in character, but later symbols are more distinctly Christian. The vine, fish, anchor, dove, and olive branch were among the earliest, but later ornament was of a much more elaborate nature, and whole scenes and episodes from Scripture history were portrayed. The more elaborate tombs are all of a later date, when Christianity was no longer a persecuted religion. The catacombs of Paris—unlike those of Rome—were simply subterranean quarries, and were not excavated with any view of burial.

Catafalque (Ital. *catafalco*, whence comes through the French the word *scaffold*), denotes a kind of scaffold or baldachin, erected (generally in a church) over a coffin and sometimes over a tomb. where it would remain for months. Some of these catafalques were very elaborate in design and ornamentation.

Catalani, ANGELICA, the daughter of a goldsmith at Sinigaglia, was born in 1782, and being sent to the convent of St. Lucia, near Rome, as a pupil, she soon attracted attention by her fine voice. Her father, under pressure of pecuniary embarrassment, allowed her to appear on the operatic stage at Venice when she was but fifteen. She then sang at various cities in Italy with great success, and about 1802 went to Lisbon, where she remained some five years, marrying M. Valabrèque, an attaché at the French embassy. In December, 1806, she sang for the first time in London in Portogallo's *Semiramide*, and the effect was marvellous. For seven years she was the idol of the English capital, and earned what was then an unprecedented fortune. In 1815 she was tempted by Louis XVIII. to take the management of the Italian Opera in Paris, but her policy of excluding all talent but her own was fatal to that enterprise, and in 1818 she began a series of European tours. Her magnificent voice, unrivalled for flexibility, compass, and power, had never been properly trained and had been used too early. In 1817 it began to show signs of deterioration, but still preserved its charm till 1824, the last four years being spent in England. She continued to sing on the Continent up to 1830, when she finally retired with her children to Florence, where she founded an academy for the musical education of girls. Madame Catalani's vocal gifts were not a little aided by her personal beauty, and by her sweet

and generous disposition. Her liberality to the poor, to public charities, and to less prosperous members of her own profession, was unbounded. She died in Paris in 1849.

Catalonia (Sp. *Cataluña*), an old province of Spain and principality of the kingdom of Aragon, occupies the N.E. angle of the Peninsula, being bounded on the north by the Pyrenees, on the east by the Mediterranean, on the west by Aragon, and on the south by Valencia, and having an area of 12,483 square miles, with a coast-line of 240 miles. Much of the surface is occupied by offshoots of the Pyrenees, and the Sierra Llena cuts the district in two. The chief rivers are the Ebro, the Ter, and the Llobregat. Though the soil is light, the climate moist, hot, and variable, and the differences of altitude very great, vegetation is luxuriant, nuts, oranges, wine, figs, almonds, olive oil, cork, and esparto being exported largely. Meadows are rare, and therefore few cattle are reared, but numbers of sheep find pasturage on the mountains. Cereals are not sufficient for home consumption. The coast, though deficient in harbours, abounds with fish. The mineral resources are but imperfectly developed. There are manufactories of cotton, silk, and woollen goods, cordage, brandy, paper, and fire-arms. Barcelona, the capital, does a great trade with England, France, Italy, and the Spanish colonies, and distributes imports all over Spain. Catalonia is now divided into the provinces of Barcelona, Tarragona, Lerida, and Gerona. The chief towns are Tortosa, Gerona, Figueras, Lerida, Manresa, Rosas, Matara, and Tarragona, the three last being ports. The province, under the name of Hispania Tarraconensis, was the earliest Roman conquest in Spain. The Goths became its masters in the fifth century, and were succeeded by the Moors 300 years later. In 788 a dynasty of French counts under Charlemagne was established and soon became independent. By the marriage of Raymond with Petronilla of Aragon in 1137 the province was united to the latter kingdom. It was not till 1714 that, after many struggles, Catalonia was finally incorporated with Spain.

The inhabitants of Catalonia belong almost more to the Provençal (South French), than to the Castilian (Central Spanish), group of Latin peoples. They are of a vivacious, sanguine temperament, more refined and less cruel than the average Spaniard, although charged with a certain rough and even haughty bearing, due doubtless to the long enjoyment of civic rights and self-government. They are rather below the middle height (5 feet 4 or 5 inches), of bronze or swarthy complexion, with black, brown, or chestnut hair, bright deep-set eyes, large but not aquiline nose, broad prominent brow, and fine teeth. Their restless enterprising spirit, even at an early date, impelling them to distant voyages beyond the Strait of Gibraltar, is, so to say, recorded in the famous Catalan map of 1375, one of the oldest and best charts of the then known world preserved from mediæval times. Even still the Catalonians are great emigrants, not only to Madrid and other parts of the peninsula, but also to Algeria and Spanish America. The vigorous and poetic Catalonian language stands quite apart from the other Spanish idioms, and betrays many direct relations with the Langue d'Oc of Southern France. It is current not only in Catalonia but throughout Valencia and the Balearic Isles, and in parts of Roussillon and Sardinia. Although now yielding to the standard Spanish, it is still the speech of about 3,000,000 inhabitants of the peninsula, forming the important Catalan section of the Spanish nation. Like Welsh, it has its periodical literature, religious publications, and "eisteddfods."

Catalpa, a genus of *Bignoniaceæ* including four or five species of trees, natives of China, Japan, North America, and the West Indies, which thrive in London and in the south of England, where protected from cold winds. They have large simple leaves in whorls of two or three, and showy terminal clusters of flowers. Both calyx and corolla are two-lipped; from one to three of the five stamens are sterile; the anther-lobes diverge; the fruit is a long cylindrical capsule; and the numerous seeds have broad fimbriate wings.

Catalysis is a term employed to denote a class of chemical actions which are induced by the presence of some substance—the catalytic agent—which does not itself, however, undergo any perceptible change. Many can be explained on the supposition of the formation and subsequent decomposition of intermediate products in which the catalytic agent takes part; but in many cases the exact nature of the influence exerted by the agent is not yet understood. Finely-divided powders, as platinum black, frequently condition catalytic actions, and the influence of acids in causing the inversion of cane sugar, or the conversion of starch into grape sugar, may also be referred to this class.

Catamaran (Hind. *kattu*, bind, and Tamil, *maram*, wood or timber), is a raft composed generally of three logs bound side by side, the middle one being longer than the others. The man using it kneels or squats upon it, and propels it by means of a paddle. The catamaran is used by the natives of the Madras coast, as it will go through surf where a boat would not live. A species in use in Brazil carries a sail.

Catamarca, a province of the Argentine Confederation in South America, the capital of which is San Fernando de Catamarca. It is separated by the Andes from Chili on the west, but on other sides is bounded by the provinces of Salta, Tucuman, Cordova, and Rioja, having an area of 35,780 square miles. The soil is fertile and produces cereals, cotton, and Chili pepper, besides affording pasturage to many cattle; but the mines of gold, silver, tin, nickel, and copper—especially the latter—are the chief source of wealth. The capital is somewhat south of the middle of the province, and is a tolerably well-built town, dating from 1685, when it took the place of Chacra, the old capital, now in ruins. It has churches, convents,

and schools, and is a centre for the distribution of imported goods, the exports being dried figs, wine, brandy, and cotton.

Catamenia. [MENSTRUATION.]

Catamount, a trappers' name for the Puma (q.v.).

Catania (anc. *Catana*), an ancient port on the east coast of Sicily, at the foot of Etna, and 30 miles north-west of Syracuse. Owing to its excellent harbour and charming situation the city has been thrice rebuilt after destruction by eruptions of Etna. Founded in 730 B.C. by Chalcidians from Naxos, it remained independent until taken by Hiero, and colonised by Syracusans. The original settlers returned, however, and were not finally driven out till the victory of Dionysius in 403 B.C. In the first Punic war Catania at once surrendered to Rome, and appears to have been faithful. It fell into the hands of the Goths and was rescued by Belisarius. The Saracens sacked the town, and the Normans raised it almost to its former pre-eminence. In 1169, 1669, and 1693 it suffered terribly from earthquakes and irruptions of lava. The streets are well paved and spacious and the private houses remarkably handsome, whilst few cities can boast finer public buildings. The cathedral, originally founded by Roger of Normandy (1094), the university (1445), and the town-hall, form the sides of a great square. Among many monasteries (now suppressed) the chief is San Nicolo, covering 21 acres, with a noble church and a famous organ. There are about 100 places of public worship, and many asylums, hospitals, and other institutions. It is the seat of a bishopric and the residence of the grand prior of the Order of Malta. A large trade is done in exporting sulphur, grain, fruits, macaroni, olives, and in manufacturing silk, linen, and ornaments of lava and amber. The harbour has been recently enlarged.

Catania, THE GULF OF, on which the city stands, has a breadth of 18 miles, extending from La Trizza on the N. to Santa Croce on the S., and runs up for a distance of 10 miles, receiving the river Giaretta.

Catanzaro, the capital of the province of Calabria Ulteriore II., stands on a height about five miles from the shore of the Gulf of Squillace, and 30 miles S.E. of Cosenza. It has an old castle, built by Robert Guiscard, a cathedral, several convents, a royal academy of sciences, and other buildings. The chief manufactures are woollen and silk goods, and velvets, and corn, wine, and walnut oil are largely exported. The place was successfully defended against the French under Lautrec in 1515, but was almost destroyed by an earthquake in 1783.

Cataplasm. [POULTICE.]

Cataract, an impairment of the natural transparency of the crystalline lens of the eye. This may be the result of inflammation consequent upon injury, in which case the cataract is termed traumatic; or the condition may be congenital, *i.e.* the infant is born with an opacity in its lens. Lamellar or laminar cataract is a curious variety in which the lens is not opaque throughout, but there is a turbid zone, enveloping a transparent central portion of lens, and enclosed by transparent lens substance. Diabetic cataract occurs in rare instances in the subjects of diabetes. Senile cataract is much the most common variety of cataract; it is rarely met with before middle life, and beyond the fact that it is probably the result of defective nutrition, little can be said with regard to its causation. The detection of senile cataract in the early stages of the disease is not so simple a matter as might be supposed. Since the invention of the ophthalmoscope the diagnosis has been greatly facilitated. The peripheral portions of the lens are usually the first to be involved, and the surgeon often finds it necessary, before pronouncing a confident opinion, to dilate the pupil with atropine, so as to bring the outlying parts of the lens into view. The pupils of old people always lose to a greater or less extent the blackness they originally possessed, hence it is not uncommon for patients to fear that they may be the subjects of cataract, when really no such thing is the case, and all that is required is a pair of glasses to remedy the defective vision. Again, loss of sight may result from disease of the fundus of the eye, the lens being perfectly clear. The confusion of cases of this kind with cataract is not possible if a careful ophthalmoscopic examination is made.

In the early stages of cataract improved vision often results for a time from the use of atropine; hence have arisen innumerable "cataract cures." The dilatation of the pupil so produced affords, however, only a temporary relief. There is no cure for cataract but by removal of the opaque lens. The old method of effecting such removal was by couching, *i.e.* forcibly dislodging the lens from its position in the line of vision and causing it to sink down into the vitreous humour. This plan is a rough and dangerous one, and is now completely discarded. The modern operations are of two kinds. In young subjects removal by *solution* is performed. A cataract needle is introduced and a small puncture made in the anterior capsule of the lens (the pupil having been previously widely dilated). The lens matter gradually protrudes through the wound, and becomes absorbed; a second or even third operation is often necessary before a perfect result is obtained. In older persons the opaque lens is hard, and cannot be dealt with by the method of solution; an *extraction* operation, therefore, becomes necessary. Before this can be effected the cataract must become mature, and this often, unfortunately, entails a delay of months or even years. In suitable cases, however, thanks to the improvements of the modern ophthalmic art, there are few surgical operations so satisfactory as those for cataract removal. The introduction of cocaine has led to the disuse of anæsthetics in the performance of the extraction, and in skilled hands it is a very rare occurrence for a failure to occur in an uncomplicated case. After removal of the lens it is always necessary for glasses to be worn, in order to replace the loss of refractive power, which absence of the lens

entails. Moreover accommodation [EYE] is also lost, so that glasses of different strengths have to be employed for near and for distant objects.

Catarrh (from the Greek words *kata*, down, and *rheo*, to flow) is a term applied to an inflammation of mucous membranes, accompanied by a running or discharge. Thus it is common to speak of nasal, pharyngeal, laryngeal, bronchial, gastric, intestinal, and vesical *catarrhs*. The word catarrh is, however, used in a more special sense to denote an inflammation affecting primarily the mucous membrane of the nasal cavities; this mucous surface is particularly exposed to sudden changes of temperature, and few persons pass through a winter in temperate climates without suffering from nasal catarrh, which thus comes to be spoken of as catarrh *par excellence*. Inasmuch, however, as nasal catarrh has a special designation allotted to it, viz. coryza, it seems inadvisable to limit the application of the word catarrh in this way. An important exciting cause of catarrhal inflammation is *cold*, either applied directly to the mucous surface involved, or resulting from exposure of the body generally to cold and damp, the effects of the "chill" manifesting themselves in one or other mucous surface. When once the tendency to catarrhal inflammation is set up in a particular mucous membrane, that part of the body is especially apt to become affected as the result of exposure. Thus in one person a cold "flies to the head," producing the ordinary nasal catarrh or coryza; in another person bronchitis results; in another laryngitis, and so on. In some cases the intestinal tract even may be affected by catarrh as the result of a chill.

The course of a catarrhal inflammation can be accurately studied in the Schneiderian membrane (as the mucous membrane of the nasal cavities is called) from its accessibility to inspection. In coryza or catarrh of this membrane there is seen to be redness and swelling. The nose feels stuffed up, not in the initial stage from excessive secretion, for the mucous surface is abnormally dry, but from mere tumefaction of the mucous lining; the contact of cool air or of any irritant readily provokes sneezing, showing the increased irritability of the inflamed and tender surface; there is a slight rise in the temperature of the body, accompanied by a feeling of chilliness, or by actual rigors, and the pulse is quickened. The dry swollen mucous membrane then commences to secrete an irritating fluid, at first thin and watery, then becoming viscid and yellowish; in other words the initial "serous" discharge subsequently takes on a "muco-purulent" or "purulent" character. The catarrh is seldom limited to the Schneiderian membrane, it often extends to the frontal sinuses, giving rise to a sense of weight and oppression over the eyes; or it passes along the lachrymal sac to the conjunctiva, causing conjunctivitis with the coursing of tears down the cheeks; or it may involve the pharynx, or be followed by an attack of bronchitis.

The majority of cases of simple nasal catarrh run their course in two or three days' time, and the particular plan of treatment the patient happens to have adopted is, of course, credited with the cure of the disease. Hence the multitude of infallible specifics for a cold in the head. It is possible that a catarrh may be checked in suitable cases at the outset by promptly enforcing retirement to bed and inducing perspiration by administering some diaphoretic drug. Such cases are certainly few and far between. Much can be done, however, in the way of placing the patient under the most favourable conditions for facilitating the natural process of recovery. The very fact of catching cold implies that the general health is not what it should be, and trivial as the complaint usually is, it is most desirable that every effort should be made to prevent a simple malady from being converted into a serious one by mismanagement and neglect. Confinement to the house should be the first condition of treatment, and in most cases the patient had best go to bed; a mild aperient is usually beneficial. A tonic may be administered, and in the case of an adult a five-grain dose of Dover's powder taken at bed-time. Diet should be light in the initial stages, but as soon as the appetite begins to return, good feeding will help to hasten recovery. If the cold is not better after two or three days of such treatment, medical advice should be procured. The worst feature of the infallible cures is that they lead to the neglect of ordinary precautions. People are naturally unwilling to lay up, and yet they feel that they ought to do something, so they go through the day's work in the ordinary way, and take from time to time a sip of something or other to soothe their consciences. This is a mistake; if a cold is worth treating at all, it is worth laying up for, and if a man succeeds in rapidly throwing off a cold without giving up his ordinary work, it redounds to the credit of his constitution rather than to that of some vaunted specific. The plan of starving a cold and that of reducing liquids to a minimum in the hope of cutting short the discharge are both unpleasant forms of treatment, and it is very doubtful whether they ever do good. Certainly in all but the mildest forms of catarrh they are productive of harm.

Catarrhini, a name for the Old World monkeys, and therefore equivalent to the modern family Simiidæ. [ANTHROPOID APE, APE, BABOON, MONKEY.]

Catawbas, an historical nation of North America, formerly widespread throughout the present states of Virginia and both Carolinas. By some writers they have been identified with the Eries, or so-called "Neutral Nation," who were partly destroyed, partly driven southwards from their settlements about the Niagara river by the Iroquois in 1656. But the Catawbas appear to have been really a branch of the great Muscogee family of Alabama and Florida. They are now extinct or else absorbed in the Chickasaws and Choctaws of Indian territory; but their name survives in the geographical nomenclature of their former domain, as in Catawba county, N. Carolina, and the Great and Little Catawba rivers, which flow from the Black Dome (Alleghanies) through the Wateree to the Santee.

Cat-bird (*Galeoscoptes carolinensis*), an American thrush-like bird passing the winter in the southern states, and migrating northward in spring. Length about 9 in., general upper surface blackish-grey or slate-colour, paler beneath. It is allied to the mocking-bird, and has considerable power of mimicry, but when annoyed its note is like the mew of a cat. The name is also given to the species of Ailuredus. [BOWER-BIRD.]

Catch, in *Music*, the term now applied to a round in which the words form the most important part, and, by their mis-pronunciation or the odd mixture in the different parts, cause considerable amusement. Originally the catch was simply a round for three or more voices, written as a continuous melody.

Catechism literally means oral instruction, and in the early days of Christianity was applied to the teaching given to the candidates for baptism. It was afterwards extended so as to include a compendium of the faith to be required of Christians, arranged in the form of questions and answers. Luther propounded a catechism, and the Calvinists of Geneva issued a larger and a smaller catechism which was adopted in Scotland by the reformers in 1560. The Society of Friends commonly use a catechism compiled by Robert Barclay. In the Roman Church the Tridentine catechism of 1563 is of authority, but each diocese has a discretionary power to use one of its own, and most dioceses in England chiefly employ the penny catechism. The Eastern Church issued a larger catechism in 1640, and at Peter the Great's command a smaller was compiled in 1723, but these are both now superseded. The authors of the Church of England Catechism, as set forth in the Book of Common Prayer, are unknown; but the second part relative to the Sacraments of Baptism and the Lord's Supper was added by the Hampton Court Conference in 1604. This has been much modified by the Episcopal churches in Ireland and America. The Presbyterians possess a larger and a shorter catechism, the former for the use of adults, the latter for that of children. The Church of England in the Baptismal Office commands that children be instructed in the Church Catechism before being presented for confirmation.

Catechu, or CUTCH, an astringent extract largely employed in tanning and dyeing and to some extent in medicine, which is prepared from several plants. Ordinary *black catechu*, *Pegu cutch*, or, as it was long ago named in European pharmacy, when its origin was unknown, *terra japonica*, is prepared in India from the dark red heart-wood of *Acacia Catechu*, a small spinous tree, and that of *A. Suma*, by boiling and evaporation. It is dark brown, almost black, shining and brittle. The pale catechu, *Catechu pallidum* of pharmacy, or *gambier* of general commerce. is prepared from the leaves of *Uncaria Gambir* and *U. acida*, rubiaceous plants of the Straits Settlements and adjoining states. It is pale brown or yellow, less lustrous and more earthy in its fracture. Catechu is soluble in boiling water, and consists chemically of a mixture of the more soluble amorphous catechu-tannic acid, the less soluble white needle-like crystals of catechin or catechuic acid, and a brown colouring substance. In dyeing, catechu yields various drabs and browns with different mordants, and in tanning it is mainly used for canvas, fishing-nets, and very inferior leather. Great Britain imports several thousand tons of catechu annually from Bengal, and a considerably larger quantity of gambier from Singapore. A substance chemically distinct and but little used in Europe is the *kassu*, a dark-brown glossy extract from the seeds of *Arcca Catechu*, the Betel palm. The pharmacopœial preparations of catechu are an infusion, tincture, lozenges (*trochisci*), and compound powder (*pulvis catechu compositus*). They contain an astringent principle allied to tannic acid. The powder and tincture are very useful in certain forms of diarrhœa. The lozenges are useful in relaxed sore throat.

Catechumens, people who had to be catechised. A term applied in the early Christian church to those Jews and heathens who were being prepared for baptism. There were four classes of catechumens, of whom the most usual were the *audientes*, who might be present at sermons, the *prostrati*, who were allowed to join in the prayers of the faithful, and the *electi* who were prepared for baptism, and only waiting for a fit season to receive the rite. Some catechumens deferred the time of baptism as long as possible under the idea of getting rid of all responsibility for past sin by receiving baptism at the latest possible moment. No catechumen might be present at the Eucharist. There was a great catechetical school at Alexandria, and Cyril of Jerusalem issued a set of twenty-three lectures in 348 A.D. St. Augustine also wrote *De Catechizandis*. The name afterwards was applied to those preparing for confirmation.

Categories, or HEADS OF PREDICABLES (Gr. *kategorein*, to accuse, hence to state), the heads under which all logical terms and all objects of knowledge have been arranged by philosophers. Aristotle considered knowledge and existence under the heads of Being, Quantity, Quality, Relation, Place, Time, Position, State or Condition (*habitus*), Action, Passion. These heads have been much discussed, criticised, and modified. The Stoics considered Being under the heads of substance, quality, and relation. Trendelenburg, who looked upon Aristotle's categories as in some measure corresponding with the parts of speech, considered Being as motion under the conditions of time and space and as divisible under what he called mathematical and real categories. Kant's categories (twelve in number) are the leading types of concept implied in the judgments of which all our knowledge consists—including unity and plurality, substance and cause, etc.—the forms of thought without which knowledge could not subsist: while Hegel's are the concepts successively posted by Absolute Thought in the construction of the Universe, and also by human thought in the history of the race and the individual. J. S. Mill classed

possible knowledge quite differently from Aristotle, and in a way hardly consistent with his own Idealism. He makes four classes: (1) States of consciousness or feelings; (2) the mind which feels; (3) external objects which excite feelings; (4) relations between feelings. Spencer (*First Principles*) points out how reasoning often consists in bringing phenomena under an ever-widening circle of other phenomena.

Catenary (Lat. *catena*, a chain) is the curve taken up by a chain when supported at its ends. The ordinary catenary in mathematics would be the shape assumed if the chain were perfectly flexible, inextensible, and of uniform character throughout; *i.e.* any inch length having the same mass. This special curve is, therefore, chiefly of theoretical interest, as it never occurs in practice. If the weight of the chain is distributed so that equally-spaced vertical lines intercept equal weights of the chain, the curve is parabolic. [PARABOLA.] Thus the lowest part of an ordinary catenary is parabolic, and in all cases where we have a nearly flat catenary, as with telegraph-wires, we may advantageously assume that the curve is parabolic. Also it follows that in the case of a suspension bridge, where a uniform roadway is supported by vertical rods at equal intervals, the chains from which it hangs will assume the parabolic form, instantly disturbed, however, by the local addition of any load to the roadway. The stress at the supports of a catenary of given length becomes greater as the supports are taken farther apart. Hence the objection to making telegraph wires too taut.

Caterpillar, the name of the first of the three stages of the life of an insect after its emergence from the egg. The caterpillars of the Lepidoptera (butterflies and moths) are the best known, and most typical. They are generally elongated and worm-like: the body is not definitely divided into three regions, as in the adult. There are no wings, but the rudiments of these can be found in some cases. The caterpillar crawls by means of a series of short jointed legs placed along the sides of its body; as these have no relation to the legs of the adult they are known as "prolegs." The structures that develop into the legs of the adult insect or imago are three pairs of processes at the anterior end of the body: by means of these the caterpillar guides its food to its mouth, which has rather powerful jaws. The caterpillars of Lepidoptera are very various in form and colour: they are often provided with bristles or various processes, and often gain other protection from the fact of their colour and ornamentation resembling those of their environment. Caterpillars occur in other orders of Insects, but are often known by other names, such as the "maggots" of flies.

Catesby, MARK, born about 1680, became an ardent student of natural history, and in 1712 went to Virginia, where he made a fine collection. In 1719 he returned, and acquired the friendship of Sir Hans Sloane, who persuaded him to visit Carolina. He accordingly spent four years in that province, in Georgia, Florida, and the Bahamas, often amongst the native Indian tribes. He was a skilful artist, and in 1731 he began to publish his *Natural History of Carolina, Florida, and the Bahama Islands*, the greatest work of the kind produced in England up to that date. He also wrote *Hortus Britannus-Americanus*, and died in London in 1749.

Catesby, ROBERT, was born about 1570 of an English Catholic family, whose property was in Northamptonshire and Warwickshire, and who were descended from Richard III.'s minister. In Elizabeth's reign his fanatical zeal had led him into various conspiracies, and on the accession of James the increased severity of the penal laws against Papists caused him to form the project in 1604 of destroying by gunpowder the king and the parliament. He communicated this design to John Wright, and Thomas and Robert Winter. Guido Fawkes or Guy Faux was then taken into their confidence, and next Thomas Percy, of the Northumberland family, with eleven others joined in the plot, for the details of which *see* FAWKES. On the detection of the conspiracy Catesby rode into Warwickshire (November, 1605), and was killed whilst resisting the officers sent to arrest him.

Cat-fish, a name often given to *Anarrhichas lupus*, of the Blenny family, and sometimes called sea-cat, sea-wolf, or wolf-fish. It is a northern fish, more than six feet long, with strong teeth fitted to crush the crustaceans and molluscs on which it feeds. Two other species occur in the North Pacific. The name is also applied to the species of the Physostomous family Siluridæ. [BLENNY, SILUROIDS.]

Catgut, from *kit-gut*, *i.e.* gut used for kit or fiddle-strings, is the name employed for strings for musical instruments, manufactured from the intestines of sheep, horses, mules, and other animals. They are scraped, steeped in alkali, sometimes bleached, and twisted into the forms required. The best catguts—called "Roman strings"—come from Italy. Catgut is also used for clocks, bow-strings, whipcord, and other purposes. Much of that prepared from horses and mules is manufactured in France.

Cathari, a name given to a sect of heretics, otherwise called Gnostics. The word means "Puritans," and the sect, which professed to base itself upon the New Testament and certain apocryphal scriptures, aimed at a pure and ascetic life. They existed at Turin from 1035 till the fourteenth century, and under the name of Albigenses they attained some importance in Southern France. They finally disappeared under the kindly attentions of the Inquisition during the fourteenth century.

Catharine, SAINT, of Alexandria, virgin and martyr, whose day is celebrated on November 25, is alleged to have been of royal descent. She was tortured on the wheel that bears her name, and put to death for her profession of Christian faith in 307 A.D.

Catharine's, ST., is an island about 12 miles off the port of Riceborough, in Georgia, U.S.A. It

is 10 miles long by five miles broad, and is formed by the alluvial deposits of the rivers Newport and Medway.

Catharine Parr. [HENRY VIII.]

Catharine of Aragon, the daughter of Ferdinand and Isabella of Spain, was born in 1483. At the age of eighteen she was married to Arthur, the eldest son of Henry VII. of England, who died five months later. In 1502, for the sake of securing her dowry, Prince Henry, Arthur's brother, was made her husband, though he was six years her junior, but the marriage was not solemnised until after his succession to the throne in 1509. In 1516 she gave birth to Mary, who afterwards became queen, and in 1527 Henry, hearing that there was little prospect of male issue, and being enamoured of Anne Boleyn, professed that his conscience was awakened to the sin of having married his brother's wife, and sought for a divorce. Wolsey seconded the king's efforts in the hope of arranging an alliance with France, but the Pope and Charles V., Catharine's brother, resisted his schemes. In 1533 Henry, having privately married Anne Boleyn, convened an ecclesiastical court in London, over which Cranmer presided, and the decree of divorce was pronounced. Catharine, under the title of Dowager-Princess of Wales, retired to Kimbolton Castle, in Huntingdonshire, where she died brokenhearted in January, 1536. She was a devoted and faithful wife to the king, a good mother, and a pious, amiable woman. Her character and the events that led to her ruin and death have been made familiar to all by the play of *Henry VIII.*, which bears Shakespeare's name.

Catharine of Braganza, the daughter of John, Duke of Braganza, and afterwards King of Portugal, was born at Villa Viciosa in 1638. Before the Restoration, her marriage with Charles II. had been arranged in the hope of securing the aid of England against Spain. The marriage was celebrated at Plymouth in 1663, the bride bringing as dowry half-a-million of money, and the towns of Tangier and Bombay. Her inexperience and want of tact, combined with her adherence to Roman Catholicism, made her unpopular in England, and her husband's infidelities broke her spirit. She bore her trials with some dignity, and lived in England very quietly until 1692. Returning to Portugal, she showed great ability as regent for her brother, Don Pedro, and died in 1705.

Catharine de Medici, the daughter of Lorenzo de Medici, Duke of Urbino, and Madeleine de la Tour d'Auvergne, was born in 1519 at Florence. At the age of 14 she married the second son of Francis I. of France, who subsequently came to the throne as Henry II. For many years she played no part in politics, being overshadowed by the influence of Diane de Poitiers during her husband's life, and of the Cardinal de Lorraine and the Duc de Guise for the few months that her son, Francis II., was king. On the death of the latter, in 1560, Catharine became Regent, as Charles IX. was only ten years of age. Her ambitious, crafty, and unscrupulous character now asserted itself. France was torn by the struggle between the Catholics, headed by the House of Guise, and the Huguenots, with Coligny and the Prince de Condé as their chiefs. For a time she openly adopted the neutral policy recommended by Michel l'Hôpital, but her real aim was only to secure her own position by playing off one party against the other. A Catholic at heart, she was resolved never to allow the Protestants to prevail. The Italian arts of lying, dissimulation, assassination, and licentiousness were freely exercised by her and by her agents to effect her purposes. When the Duke of Guise had defeated Condé at Dreux (1562) and Orléans (1563) and become a person of commanding power, he perished by the hand of a zealot. Coligny's return to favour with the young monarch, after the peace of St. Germain in 1570, stimulated Catharine to plan the massacre of St. Bartholomew two years later. Her fear of the revival of the Protestant cause, and her jealousy for her favourite son, Henry III., are believed to have led her to connive at the death of the Duc d'Alençon. The succession of Henry did not restore her influence so completely as she had hoped, and the debauched and degraded king was as ready as his mother to rid himself of a dangerous rival by the murder of the Duc de Guise in 1588, and by the use of Henry of Navarre to break up the League. Catharine had given her daughter, Marguérite de Valois, in marriage to the latter prince in accordance with her scheme for hoodwinking the Huguenots, and extending her personal sphere of action; but the result was disappointing, for Marguérite, though as little bound by moral law as her mother, proved a less skilful and less ambitious intriguer. Catharine did not live to witness the extinction of the House of Valois by the assassination of Henry III., for she died a few months before that event, in 1589. Her one redeeming feature was her love for literature and art. She built the Château de Monceau and other noble edifices, and she planned and began the palace of the Tuileries.

Catharine of Siena, SAINT, was born in 1347, being the daughter of a dyer. At the age of 20 she joined the Dominican sisterhood, having early displayed a tendency towards severe asceticism, and having been favoured with beatific visions, in one of which, rivalling St. Francis, she received the *stigmata*, or marks of the wounds of Christ. The Franciscans treated this infringement of their monopoly by the Dominicans with great indignation, and Pope Sixtus IV. forbade the propagation of Catharine's story, but it held its own the more successfully, perhaps, because of opposition. In 1376 she went to Avignon to persuade Gregory XI. to return to Rome. He did actually return, and accidentally died there, a fact which greatly enhanced her reputation. In the schism between Urban VI. and Clement VII. she very actively supported the former, but worn out by self-inflicted sufferings, she died in 1380. She left some literary remains which are of interest, owing to the period in which she lived, but hardly, perhaps, deserve all the praise lavished on them by devout admirers.

Catharine of Valois, the daughter of Charles VI. of France, was born at Paris in 1401, and after the invasion of France and the treaty of Troyes in 1420, was given to Henry V. of England, together with large territorial possessions, and the regency of France. Two years later her husband died, but not before the birth of a prince destined to succeed as Henry VI. She then contracted a secret marriage with Owen Tudor, a man of high physical and moral qualities, but immeasurably below her in rank. After some years her mésalliance was made known, and involved her in troubles that probably hastened her death in 1437. She left three sons, the eldest of whom married Margaret Beaufort, and became the father of Henry VII., the founder of the Tudor dynasty.

Cathartics, remedies employed to produce increased glandular secretion into the intestine with augmented peristaltic action. They set up an artificial catarrh (q.v.) of the intestinal mucous membrane, and, as the derivation of the word cathartic implies (from *kathairo*, I cleanse), are administered with a view to removing deleterious substances from the alimentary canal. Hydragogue cathartics are those which produce very watery evacuations. The principal drugs belonging to the group are mercurials, scammony, jalap, elaterium, and colocynth.

Cathay, the name by which China was known to mediæval geographers, and which it still bears (*Kitai*) in Russia and Central Asia. It was derived from the Khitan race or dynasty that for some two centuries maintained its independence in the northern provinces, disappearing in 1123 before the Manchus. The word, however, survived, and was imported into Europe, when the conquests of Jenghiz in the thirteenth century attracted notice to Chinese affairs. This primitive dynasty, known in Chinese history as Liao or "Iron," was displaced after two centuries by the Manchus, who, under the name of Nyûché or Chûrché, formed the Kiu or "Golden" age of China, and were extinguished by the Mongols. According to early travellers, the Khitaï or Cathayans were beardless like the Mongols, but less broad in feature, small in stature, with narrow eyes, kindly, even polished, and excelling as artists and craftsmen. Their language and their written characters seem to have been identical with Chinese, and they were skilled in the manufacture of silken tissues. Their country was generally represented as lying north of China proper, and Zipanga or Japan was regarded as an outlying island, Cambaluc being mentioned as the capital. It was not until the beginning of the seventeenth century that Benedict Goës discovered Cathay and China to be identical, and the name soon afterwards dropped out of use.

Cathcart, Sir George. K.C.B., was born in London in 1794, being the third son of Earl Cathcart, a distinguished general and diplomatist. Educated at Eton and Edinburgh, he entered the army in 1810, and accompanied his father, then ambassador at St. Petersburg, as his aide-de-camp. He served with the Russian army throughout the German campaign of 1813, and the advance to Paris in 1814. Going to the Congress of Vienna, he became attached to Wellington's staff, and was present at Quatre-Bras and Waterloo, and at the occupation of Paris. His duties called him to Nova Scotia, Bermuda, and Jamaica, between 1828 and 1834, when he went on half-pay. In 1837 he commanded the King's Dragoon Guards during the Canadian rebellion, and remained in that country until 1844. He was next appointed deputy-lieutenant of the Tower, but in 1852 was sent out as governor and commander-in-chief to the Cape, where he brought the Kaffir war to a successful issue. In 1854 he received command of a division in the Crimea, and great things were expected of him, but he fell at the battle of Inkermann on November 5 of that year.

Cathedral, the chief church of a district or diocese, so called as containing the bishop's throne. The cathedral is managed by the dean and chapter, the chapter consisting of canons, and this body has the right of electing the bishop forced upon them by the Crown. The canons are of old or new foundation, the latter term being applied to those whose origin dates from monastic bodies changed at the Reformation. Canons are appointed either by the bishop, in which case they are said to be collated, or by the Crown, which appoints by letters patent. Sometimes the Crown holds a prebend, as is the case at St. David's in Britain and has also been the case in France and in Germany. Generally a cathedral town has the dignity of being a city, but this is not always the case, as was decided by law with regard to Manchester. In the case of a town possessing more than one cathedral, only one possesses full cathedral rights. At one period any mother church of a district was called a cathedral, and though not being the see of a bishop, it yet possessed a certain *ex cathedrâ* authority.

Cathelineau, Jacques, was born in 1758, and exercised the trade of a weaver at Pin-en-Mauges, when in 1793 an insurrection broke out amongst the young men who had been drawn for the conscription. Though as a married man he was not liable to serve, he put himself at the head of the movement. His success in attacking several republican posts led to his speedy promotion to the supreme command of the Vendean forces. He ventured to make an assault on Nantes (June 29, 1793), but was repulsed and killed. His courage, honesty, and simplicity caused him to be venerated by the royalist peasants, who called him "The Saint of Anjou."

Catherine I., Empress of Russia, was born of humble parentage at Marienburg in Livonia, about 1688. Little is known for certain of her early life, but she married a Swedish dragoon in 1701, and next year was carried off to Moscow as a prisoner by the Russians, and never saw her husband again. She appears to have been the mistress first of General Bauer, and then of Prince Menschikoff, but in 1704 her remarkable beauty captivated the Czar, Peter the Great, who lived with her until 1711, when he made her his legitimate wife. She accompanied him in his campaign against Turkey,

and arranged a treaty with the Grand Vizier that rescued the Russian army from a position of great peril. In 1724 she was crowned Empress, and next year, on the death of the Czar, Menschikoff caused her to be proclaimed his successor. She was a mere tool in his hands, taking little interest in affairs of state, and being addicted to intemperance, from the effects of which she died in 1727. She had many daughters, but only three survived their father, and one of these became the Empress Elizabeth.

Catherine II., the celebrated Empress of Russia, was the daughter of the Prince of Anhalt-Zerbst, and was born at Stettin in 1729. Her names of Sophia Augusta were changed to Catherine Alexievna when she married Peter, nephew of the Empress Elizabeth, in 1745. He was a hideous, empty-headed, debauched young man, with a few good qualities, however, but he was soon detested and despised by his clever, intriguing wife, who spent the early years of their marriage in study and seclusion. Presently she became infected by the corruption of the court, and her conduct with Soltykoff, Narischkine, and Poniatowski, afterwards King of Poland, gave rise to grave suspicions. In 1762 her husband mounted the throne as Peter III., but was speedily forced to abdicate by an insurrectionary movement at which Catherine connived. A few days later he was strangled in the castle of Robocha by Alexis Orloff, one of her favourites, and she was crowned Empress at Moscow. Her life henceforth was stained by gross profligacy and unbounded cruelty, but she was a vigorous and able sovereign, promoting agriculture and commerce, encouraging literature and science, and losing no opportunity for enlarging the empire. She corresponded with Diderot, D'Alembert, Euler, and Voltaire, and drew up with her own hand a scheme for the codification of the law. She annexed Courland, putting her favourite Biron in the place of the reigning prince. As the result of several successful campaigns she won the Crimea and other provinces from the Turks. She set Poniatowski, another of her admirers, on the throne of Poland, and was the moving spirit in the infamous partition of that kingdom in 1772, thus acquiring Volhynia and Podolia. She was preparing to take part in the revolutionary war against France when she died of apoplexy in 1796, and was succeeded by her degenerate son Paul I. A curious autobiography written by her was published by Herzen in 1859.

Catheter (Gk. *kathetér*, a thing put in, or a thing let down), a long, hollow tube of suitable curvature employed by surgeons for introducing into or removing from internal cavities fluid or air. The term catheter is practically restricted to the urinary catheter and the Eustachian catheter. The urinary catheter is introduced through the urethra into the bladder with the object of withdrawing urine when there is some obstacle to the natural flow. The material of which such tubes are made is either metallic (silver or pewter) or composed of gum elastic or vulcanised indiarubber. Thus the catheter may be rigid or flexible; in the former case the form of the instrument is adapted to the course taken by the urethra. Thus a silver male catheter is a hollow rod of silver of about ten inches in length, and curved at the extremity which is designed to be inserted into the bladder. A female catheter is much shorter than this, corresponding to the different length of the female urethra. Flexible catheters are usually furnished with a *stilet*, *i.e.* a wire which can be passed along their length, and which can be bent so as to give them any particular shape which may be desired. Catheters are made of different sizes, varying from the No. 1 instrument, which will pass through a very constricted orifice, to the largest size, No. 12. A special form of catheter with a bolder curve is used in cases of retention of urine due to enlargement of the prostate gland, and is known as the prostatic catheter. The Eustachian catheter is introduced through the nose into the Eustachian tube, in order to admit of air being forced into that canal, in certain cases of ear disease. The instrument is a small curved catheter, some six inches in length.

Cathetometer is an instrument employed in physical research to measure accurately the distance between two points in a vertical line. Thus the volume of gas enclosed in a vertical graduated tube may be read at a distance from the tube by means of a cathetometer. In such a case it may be undesirable to approach closely to the tube, as the heat of the body of the observer may alter the volume required to be measured. The instrument is essentially a horizontal astronomical telescope capable of sliding up and down a graduated vertical scale. This telescope is first placed so that its axis points to one end of the required length, two fine spider-lines fitted at right angles to each other in the telescope helping to effect this adjustment accurately. The position of the telescope is read off on the vertical scale of the instrument and the telescope is then moved up or down till its axis points to the other end of the required length. Then its new position is again read off. The distance traversed by the telescope is the distance between the two ends of the required length, which is therefore determined.

Catholic Church, a somewhat vague and elastic term. Strictly it implies the whole or universal church, and is used sometimes to denote the whole body of Christian believers, at other times to denote those who take as authoritative the first four general councils, and again, especially in England, to denote the Roman Catholic Church, *i.e.* those who accept the authority and doctrine of the Pope. Hence we have the anomaly of people who recite their belief in the Catholic Church in their creed, and yet repudiate the name of Catholic. If the definition of Catholic belief, put forth in 434, *quod semper, quod ubique, quod ab omnibus*, be taken as the test of the Church Catholic, its limits must now be very contracted. However, most churches now only declare themselves branches of the Catholic Church, and admit that other churches may have an equal right to the name. [Roman Catholic Church.]

Catholic Emancipation. After the Reformation in England it was felony for a foreign priest, and high treason for a native one, to perform the rites of his religion in this realm. A Catholic could not acquire lands by purchase, and was subject to many other disabilities in exercising the rights of a citizen. Some relief from this state of things was given by Sir George Saville's Test Act in 1778, but it was received with great disfavour by the country at large, and was made the occasion of the Gordon Riots. In 1791 further relief was granted in England, and in 1792 and 1793 in Ireland, but in 1800 Pitt was unable to fulfil his promise of further relief to Irish Catholics, owing to the king's attitude of *non possumus*. In 1829 the country was ripe for the repeal of obnoxious acts, and Sir Robert Peel's Bill for this purpose received the Royal Assent in April. This did away with almost all disabilities, and the same path, in spite of an occasional check, has since been pursued. The last right given was that the Irish Lord Chancellorship may be held by a Catholic, but there are still some English offices for which Catholics are ineligible. Sir M. A. Shee was the first Catholic judge elevated to the English Bench since the beginning of the 18th century.

Catiline, or LUCIUS SERGIUS CATILINA, came of high patrician lineage, and in early life attained unenviable fame by his bloodthirsty zeal in carrying out Sulla's proscriptions, and by his reckless profligacy, which did not respect even the Vestal Virgins. In 66 B.C. he aspired to the consulship, but was impeached by P. Clodius Pulcher for extortion during his government in Africa. Thereupon he formed a conspiracy, in which Crassus and Cæsar were suspected of complicity, for murdering the consuls and all opponents, and for seizing supreme power. The plan collapsed, but by dint of bribery Catiline was acquitted in the trial for extortion, and again became a candidate for the consulship, having extended and strengthened his plot in the meanwhile. Cicero, by his denunciations, foiled this scheme, and with M. Antronius was elected for the year 63. Informed by Fulvia, Catiline's mistress, of all that was passing in the secret conferences of the conspirators, the new consul succeeded in thoroughly alarming the senate, but really produced no evidence in support of his charges save the statements of Allobrogian envoys, with whom the conspirators had been in correspondence. On the strength of these reports Lentulus, Cethegus, and Statilius were seized and put to death, though Cæsar protested against the proceedings as illegal, while Cato as strenuously upheld them. Catiline escaped to his army, but his half-organised forces were unable to cope with the legions under the nominal command of C. Antonius. He was defeated and killed at Fæsulæ in 62. What we know of his character and policy is derived mainly from his opponents, whose assertions must be received with caution. However worthless he may have been personally, he undoubtedly represented the popular party in its struggle against the aristocracy of Rome, and his parallel may perhaps be found in such restless spirits as the Duc d'Orléans (Égalité), and similar intriguers of the French revolutionary period.

Catkin, a term originally applied to the elongated pendulous male inflorescence of sessile flowers, individually inconspicuous, in the hazel, which, after the discharge of its pollen, falls off entire. The arrangement of the sessile flowers is such that in some cases the inflorescence is simple, in others compound. Typically each catkin-scale or bract has a flower in its axil with two bracteoles, these bracteoles having also flowers in their axils with secondary bracteoles; but the type is departed from by the absence either of the central or the lateral flowers, or of some of the bracteoles. The term has been extended to inflorescences, like those of the Spanish chestnut, which include some bisexual flowers; to those in the willows, which are erect instead of pendulous, female as well as male, and which, when the former, are not deciduous; or to those of the birch, which fall to pieces instead of coming off entire. The Latin term for a catkin, *amentum*, gives the name *Amentaceæ* to a group of trees bearing catkins.

Catlin, GEORGE, was born at Wilkesbarre, Pennsylvania, U.S.A., in 1796. He was educated for the law, but being a skilful painter took to art as a profession. In 1832 he resolved to make a thorough study of the American Indians, who were fast disappearing before the advance of civilisation. He spent several years among the various tribes, both of North and South America, and in 1840 exhibited his pictures in London, where next year he published his great work, *The Manners, Customs, and Conditions of the North American Indians*. In 1844 appeared his *North American Portfolio*, and in 1848 an account of the adventures of the red men whom he had brought over with him to Europe. Finally, in 1868 he printed his *Last Rambles among the Indians of the Rocky Mountains and the Andes*. He died in Jersey city in 1872.

Cato, MARCUS PORCIUS, often spoken of as CATO MAJOR, to distinguish him from his great-grandson, and known also as Censor, Priscus, and Sapiens, was born at Tusculum in 234 B.C. He came of a good old plebeian stock, and was trained to agriculture and to military service. He fought under Fabius against Hannibal at Tarentum (209) and distinguished himself at the battle of the Metaurus (207). In the intervals of war he so lived on his farm, once the property of Curius Dentatus, as to earn from his neighbours the nickname of the Wise. L. Valerius Flaccus induced him to migrate to Rome, where he was elected successively quæstor (204), ædile (199), prætor (198), and consul (195). In 202 he took part in the final defeat of Hannibal, at Zama, and in 194 he gained a triumph for the subjection of Spain. Three years later he co-operated, as military tribune, with M'. Acilius Glabrio in crushing Antiochus, and wresting Greece from the domination of the East. He now devoted himself to civil affairs, and to a noble, if rather narrow-minded, struggle against the changes in character, manners, and religion that the extension of the empire was quickly bringing about. He fearlessly assailed the weak points in the careers of

such successful soldiers as Acilius Glabrio, Fulvius Nobilior, and Minucius Thermus, and stimulated the prosecution of the two Scipios. Elected censor in 184, he made unflinching use of his power in weeding out from the ranks of the senators and knights all who did not come up to his high standard of honour and duty, not scrupling to strike out so eminent a personage as L. Quinctius Flamininus. He advocated minute sumptuary legislation, opposed the spread of luxury amongst women as well as men, and denounced the introduction of licentious rites. He acted up to his principles with rigid consistency. His life and his household were regulated in every detail, and even his wife held a position little better than that of a slave. It must not be supposed that his attacks on the rising generation provoked no retaliation. He had to bear many hard blows in return, and at the age of 81 was forced to defend himself against a capital charge. Sturdy to the last, one of his final public acts was to urge his countrymen into the third Punic war with the famous cry "Delenda est Carthago!" and almost immediately before his death in 149 B.C. he appeared to prosecute Sergius Galba for his treacherous slaughter of the Lusitanians. Of his 150 collected speeches none remain, but his treatise *De Re Rusticâ* contains valuable information, and the fragments of his *Origines* supply a few details as to Roman history. His *Apophthegmata* have wholly perished. Notwithstanding his hatred of everything foreign, he learned Greek at the age of 80.

Cato, MARCUS PORCIUS, called after his death, UTICENSIS, was born in 95 B.C., and inherited much of the harsh, stern, pedantic spirit of his great-grandfather, but, brought up in the house of Livius Drusus, he became very early a priest of Apollo, and having learnt the elements of the Stoic philosophy from Antipater, he modified slightly the roughness of his natural character by shaping it to a Greek ideal. He fought in the ranks against Spartacus, served as a tribune in Macedonia, and returned home to take up the quæstorship. His probity and zeal led to his being entrusted with an appointment in Asia. He is said to have been disgusted in early life with the excesses of Sulla, and his personal acquaintance with the public men of the day led him to condemn them all for corruption and ambition, though he was willing to accord Lucullus a triumph for his military abilities. He resisted the encroachments of Pompey, and as tribune he prosecuted Murena for bribery. Cicero's successful defence of the latter did not prevent Cato from joining heartily in the proceedings against Catiline, and a little later the aristocratic party made a tool of him in thwarting the policy of the triumviri, who sent him on discreditable missions to the king of Cyprus and to Byzantium, his sense of duty forbidding him to refuse. In 54 B.C. he secured the prætorship, and exerted himself to put a stop to bribery, with no better success than to deprive himself of the chance of the consulship. He then conceived that the only way of successfully combating the growing power of Cæsar was to support the Pompeian faction. To his utter disgust the cause was abandoned without a struggle in Italy, but he followed his nominal chief to Epirus, though he was not present at the battle of Pharsalia. When Pompeius threw over his party, Cato, with a small remnant of true republicans, crossed to Africa, marched heroically through the Libyan deserts and shut himself up in Utica. He might have surrendered on terms honourable to himself, but he feared lest his followers should suffer. He held the town until they had escaped by sea, and then, retiring to his couch, stabbed himself in 46 B.C. His life was wasted so far as contemporary history was concerned, but he became to future generations a kind of patron saint of Stoicism. Yet there was nothing saintly about him. His philosophy was pure self-regard—not, it is true, of a mean and ignoble description, but of a nature that, despite the professions it made to the contrary, practically excluded all sympathy with fellow mortals and all communion with God.

Cato Street Conspiracy, an insignificant plot to assassinate Lord Castlereagh and other ministers in 1820, and so called from the fact of the conspirators meeting at Cato Street (now John Street) in the Edgware Road. One of the gang betrayed the plot to the police, and Thistlewood and four others were hanged, while five were condemned to transportation.

Catrail, THE, a remarkable earthwork which begins at the river Gala, about a mile from Galashiels, and extends to Peel Fell, Northumberland, a distance of 50 miles. It is also known as "The Devil's Dyke" and "The Picts' Work Ditch." Consisting of an excavation, with a wall or bank on either side formed of the excavated materials, it resembles similar Keltic works in various parts of the kingdom. Various theories have been propounded as to its origin, since attention was first called to its existence by Gordon's *Itinerarium Septentrionale* in 1726.

Cats, JACOB, born at Brouwershaven in Zealand in 1577, studied with distinction at the University of Leyden, and having spent some time in France and Italy to learn the language, settled as an advocate at the Hague. A severe attack of tertian fever drove him to seek a change in England, where he learned the language, but did not recover his health. At last, on his return home, a wandering quack gave him a remedy. He now married and settled at Middleburg, devoting himself to farming and poetry. He produced *The Emblems of Fancy and Love*, *Galatea*, a pastoral romance, *The Mirror of Past and Present*, and *Marriage*, with other works. His simple, flowing style, his genial wisdom and fund of maxims and humorous illustrations. at once gained him popular favour. "Father Cats" is still venerated in Holland, but his antiquated diction prevents his being read. In 1621 his quiet pastoral life was broken up by the opening of the dykes, but he was provided for by a magistracy, and ultimately rose to be Grand Pensionary of Holland. He visited England twice as a political envoy, and was knighted by Charles I. His later works comprise *The Nuptial Ring*,

Eighty-Two Years of My Life, Old Age and Country Life, Coffins for the Living, etc. He died in 1660, and was buried with great honour in the Kloosterkerk at the Hague.

Catseye, a variety of quartz containing fibres of some asbestiform mineral, so that when cut *en cabochon*, *i.e.* with a rounded or oval surface, it exhibits a moving beam of internally reflected light, as does a cat's eye, whence this property is called *chatoyance*. Catseyes are generally grey or bluish, and form gems of some value; but the African catseye occurs abundantly in the Asbestos mountains of Griqualand. It is quartz penetrated by fibres of crocidolite, a greenish asbestos, which is often altered into limonite or hydrous iron oxide so as to produce a beautiful golden-brown catseye. This has of late been largely imported, and unfortunately artificially coloured. It is largely used for the handles of parasols and canes.

Catskill Mountains, celebrated as the scene of Rip Van Winkle's prolonged slumbers, are situated in New York state. They are for the most part steep, reaching an altitude sometimes of about 4,000 ft., and covering an area of about 5,000 square miles. They belong to the Appalachian range.

Cattaro, a seaport and town of Austria in the Crown land of Dalmatia, is situated on the Gulf of the same name, which is an inlet of the Adriatic. It formerly belonged to the republic of Venice, but came under the sway of Austria by the treaty of Vienna, 1814. Its chief feature is its cathedral.

Cattegat, a bay of that portion of the North Sea between Sweden and Jutland, communicates with the Baltic by the channels of the Sound and the Great and Little Belts (q.v.), and with the German Ocean by the Skager Rack. Its length is 150 miles, its breadth 85 miles, and though in some parts it reaches a depth of 36 fathoms, it has many sandbanks, and on account of the storms to which it is subject is perilous to shipping.

Cattermole, GEORGE, artist, was born in 1800, at Dickleborough, Norfolk. Engaged at an early age to a topographical draftsman, he worked on Britton's *English Cathedrals*, and illustrated the *Waverley Novels*. He also illustrated the *Historical Annual*, a work by his brother, the Rev. C. Cattermole. Elected as member of the water-colour society in 1833, he contributed to its exhibitions his finest works in this department of art. In 1855 he gained a first-class gold medal at Paris, and in 1863, having meanwhile taken to oils, he exhibited *A Terrible Secret* at the Royal Academy. He died in 1868 at Clapham Common.

Catting is the operation of drawing a ship's anchor perpendicularly up to the cat-head, or, where there is no cat-head, of placing the anchor at rest in its berth on board. In large ships catting is now usually performed with the assistance of a strong davit, to which suitable tackle is affixed. The cat-heads are two stout and short beams of timber projecting nearly horizontally from a ship's bow, one on each side.

Cattle (the same word as *capital*, *i.e.* wealth, and another form of *chattel*), a term formerly used to denote property in general, hence transferred to cows and oxen, which constituted the chief wealth in pastoral times. It is an agricultural rather than a zoological term; and the different breeds known to English farmers, with some others on the Continent of Europe, are all forms of the domestic ox (*Bos taurus*). Those with which we are chiefly concerned—the breeds of the United Kingdom—are usually reckoned to be fourteen in number (Shorthorns, Herefords, Devons, Sussex, Norfolk Red Polled, Longhorns, Welsh, Black Galloways, Kerrys, Polled Aberdeen-Angus, West Highland, Ayrshire, Jerseys, and Guernseys). These forms differ greatly in size, shape, and colour, as will be seen in the detailed description of each breed. This diversity is due to four factors:—(1) The mixed origin of the present breeds; (2) the tendency of animals to vary under domestication (q.v.); (3) the fancy of breeders for perpetuating any given variation; and (4) the effect of environment (q.v.). The period at which cattle were first domesticated must be very remote, as they are mentioned in the earliest writings of which we have any knowledge, and their bones have been discovered in dwellings dating back to Neolithic times. It is generally supposed by naturalists that the European breeds—our own included—are descended from three distinct forms—*Bos primigenius*, *B. frontosus*, and *B. longifrons*. To these some systematists give specific rank, but Lyddeker and Nicholson consider *B. primigenius* to have been only a variety of *B. taurus*, and the last two mere stunted races, from which it is probable that the small cattle of Wales and Scotland are derived. The first, mentioned by Cæsar as the Urus (q.v.), though practically extinct, has left some descendants not greatly altered, except in size, from the original type. These live in a half-wild state in herds in Chillingham Park, Northumberland, and at Cadzow, near Hamilton, Lanarkshire, while much smaller herds exist at some other places, and at least one herd has died out within living memory. They are white in colour, with black rims round the eyes, the muzzle, hoofs, and tips of the horns black, the inside of the ears reddish-brown, and the flanks and shoulders shaded with grey. Other descendants are still to be found in Hungary, Spain, and Italy, but these differ more widely from the parent form.

1. *Shorthorns* are the most numerous, most widely distributed, and most important of all the native breeds. They originated in the north of England, and were first bred systematically by the brothers Colling, of Barmpton and Ketton, Durham, who profited by the experience of Mr. Bakewell, of Dishley, Leicester, to whom the improvement in Longhorns is due. The first public sale of cattle of this breed by the Collings took place in 1810, when the bull "Comet" fetched £1,050. During their lifetime Mr. Bates, of Kirklevington, and Mr. Booth, of Warlaby, also bred Shorthorns, and from their stock are descended two strains known respectively as "Bates" and "Booth" Shorthorns. The general outline is square, the coat mossy, the muzzle and skin round the eye cream-coloured, the

horns of moderate length; the colour varies from red to white, or is red and white mixed. These cattle are very docile, arrive early at maturity, make little offal, are good milkers, and lay on flesh readily.

2. *Herefords* are about equal to Shorthorns as meat-producing animals, but as milkers they must take a lower place. The herd which fixed the characters of this breed was sold in 1819, and so supplied sires and dams to farmers outside Herefordshire. In form these cattle are longer than the Shorthorns, with deeper shoulders and the buttocks not quite so straight. The general colour is red, with the face, breast, belly, feet, top of tail, and tops of the shoulders white. This breed is in high estimation in many parts of the United States and in Canada, New Zealand, and Australia.

3. The *Devons* are a small, symmetrical race, found chiefly in Devon, Somerset, Dorset, Hants, and Wilts. They vary in colour from a rich dark red to chestnut, occasionally with a patch of white on, or just in front of the udder. The oxen are much larger than the cows or bulls, and make admirable draught animals. The hair may be smooth, or curly and mossy, and the skin is often mottled. The shoulders are smooth, and the back well filled behind them; the general form compact, and the buttocks somewhat rounded. These cattle do not give large quantities of milk, but the quality is high, and Devonshire cream is noted all over the country. On a given quantity of food it is said that they will make more beef than any other breed, while the meat itself is firm, well-flavoured, and juicy. The bone is usually very fine, and the quantity of offal is small.

4. *Sussex* cattle are in many points similar to Devons. They are red in colour, but of much larger size, coarser, not so symmetrical in form, and with large, spreading horns. They are probably descended from the original Devons. They were largely bred for draught and for the butcher, to the neglect of their dairy qualities, but, with the disuse, to a large extent, of oxen for draught animals, more attention is being paid by breeders to the capacity of the cows for producing milk.

5. The *Norfolk Red Polled* cattle are said to have originated from the Suffolk poll, which was the result of crossing the old Suffolk dun with the cattle of the district. The Suffolk duns were yellowish-red cows, supposed to be the descendants of the Galloways formerly driven from Scotland to fatten in the fertile meadows of East Anglia. In general form the Norfolk Red Poll is not unlike the Sussex, but the horns are replaced by the high knobs which always mark hornless cattle. The colour is a uniform rich red. Till recent years Norfolk and Suffolk were more noted for corn-growing and grazing than for dairy farming, but latterly more attention has been paid to the production of milk, and these cattle are now bred so as to combine a good yield of milk with the quality of rapidly laying on flesh.

6. *Longhorns* are very distinct in character, and unlike any other race. They originated in the Vale of Craven in the west of Yorkshire and the east of Lancashire, and were the first race systematically bred with a view to perpetuate useful points and to eliminate defects. This good work was accomplished by Robert Bakewell, of Dishley, near Loughborough, Leicestershire, about the middle of the eighteenth century, and to him is due the credit of having laid the foundation of the systematic breeding of modern times. Bakewell did his work so well that the breed soon spread all over England. The Shorthorns were the first to contest their supremacy, and now the race is rapidly diminishing. The body is long, and supported by short legs; the colour is brindled with mixed red, yellow, and black, and black and white, with the white predominating along the back and belly. The peculiar feature is the horns, which are often over 30 inches long; they grow downwards and turn in towards the jaw, sometimes to such an extent as to prevent the beasts grazing short grass. The breed was esteemed both for dairy and grazing purposes.

7. The *Welsh Cattle* are closely related to the half-wild cattle of Chillingham and Cadzow. Three strains of blood, if not three breeds, may be noted:—(1) The *Glamorgans*, now nearly or quite extinct. They were excellent milkers, and made good beef. The cows were red or rich brown, and the bulls invariably black with more or less white. (2) The *Angleseas*, celebrated as grazing stock, and differing little from (3) the *Pembrokes* or *Castle Martins*, which should be black, any white being regarded as an indication of strange blood. They are very hardy, and useful both to the grazier and the dairy farmer.

8. *Black Galloways* are an ancient breed found principally in the three counties of Scotland which lie farthest to the south-west—Wigton, Kirkcudbright, and Dumfries. They are strongly built, rather low in stature, of hardy constitution, jet black in colour, and hornless. The milk-producing qualities of this breed have been neglected, and they have been bred with the view to producing as much meat as possible. The milk, however, is very rich in fats, and the breed would improve greatly as milkers if more attention were devoted to this point, and the practice of allowing the calves to suck the dams were abandoned. In Scotland these cattle are rarely housed, and the young are generally sold to graziers in England for fattening.

9. The *Kerrys* are undoubtedly aboriginal and the only native Irish breed. They are slender in form, with fine long limbs, small head, and horns which, after projecting forwards, turn suddenly backwards. The general colour is black, with a small patch of white in front of the udder. They are very numerous in County Kerry, are excellent milkers, and from their gentle disposition and capacity to do well when tethered on small bits of grass are well adapted for small villa farms. House-feeding also agrees with them admirably. The *Dexter* variety has a round plump body, short, thick legs, heavier head, and longer, straighter, and coarser horns.

10. *Polled Aberdeen* and *Angus*, though originally distinct breeds, are now generally classed as one. They bear a general resemblance to the Galloways, but are longer in the limbs and not so

compactly built. They are very hardy, good breeders, little liable to disease, arrive early at maturity, and fatten quickly. The prevailing colour is black, but dun and shades of yellow are not uncommon. The cows give a small quantity of milk for their size, but the bad practice of allowing the calves to suck the dams is chargeable with this, for many Angus cows make good dairy cattle. This breed won the prize at the Paris Exhibition of 1878 for the best group of foreign cattle.

11. *West Highland Cattle* or *Kyloes* are essentially mountain cattle, and representatives of an ancient race, and those of the mainland greatly exceed in size those of the islands of Orkney and Shetland. They are distinguished by their symmetrical form, their fearless mien, shaggy coats, and long horns, with which they are apt to gore each other, for their disposition is pugnacious. In hue they are generally self-coloured—yellowish brown, black, silver-grey, or red, but occasionally brindled. They are very hardy animals, and will pick up a subsistence where lowland cattle would starve. Their carriage is bold and striking, and they are often kept in parks. The cows give a fair quantity of milk for their size, but the breed is more valued as meat-producers; their beef is of excellent quality and commands a high price.

12. The *Ayrshires* are a hardy breed of heavy-milking dairy cattle, with an infusion of West Highland blood, which is shown by the shape of the horns and the temper of the animals. They are of small size, and the general colour is red and white or yellow and white, occasionally self-coloured, and shaded to dark brown. According to Mr. Scott Burn (*Outlines of Modern Farming*), cattle of this breed are justly celebrated for dairy purposes; indeed, they seem to possess the power of converting the elements of food more completely than any other breed into cheese and butter.

13. *Jersey Cattle* are distinguished by their deer-like head, full eyes, and curved horns. They are of medium size and generally fawn with a darkish shade, which is not inaptly described as smoke-coloured, and which approaches that of the cattle of Switzerland and the Tyrol. They are essentially butter cows, and lay on flesh slowly. A few are often kept in large dairies to impart a rich colour to the milk and butter.

14. The *Guernsey Cattle* are somewhat larger and fuller in form, of hardier constitution, and yellow and white in colour. They are good milkers, and are frequently kept by private householders. Both these breeds were formerly known as *Alderneys*, from the fact that Alderney was the shipping point from the other islands to England, and so gave its name to all cattle exported to England from Jersey, Guernsey, Sark, or the mainland of France. In the Channel Islands the cattle are always tethered or tended by children, and are never allowed to roam at will.

The cattle of the chief English colonies are, as might be expected, in large measure descendants of English breeds, or the native cattle have been greatly modified by the importation of English bulls for breeding purposes. A similar state of things obtains in the United States, where herds exist in no whit inferior to many of those in Britain, and on that side of the Atlantic, as on this, the Shorthorns are, on the whole, the most highly esteemed. [Dairy Farming, Farming.]

Cattle Plague, or Rinderpest, is a contagious disease which affects ruminants, particularly oxen, and which is happily of only occasional occurrence in Great Britain. The natural home of the disease is Central Asia (Persia, India, and China); it is of not infrequent occurrence in Russia, and has been from time to time imported into Great Britain. Outbreaks innumerable of fatal murrains affecting cattle are on record, and some of these are, probably with justice, supposed to have been rinderpest; in the absence of detailed descriptions of symptoms it is, however, very difficult to pronounce with certainty upon the diagnosis of a malady which has only been scientifically studied within quite recent times. The most recent serious outbreaks of the disease which have occurred in Great Britain were those of 1865 and 1872. The chief symptoms of rinderpest are high fever, accompanied by inflammation of certain mucous membranes, with great prostration, and in most cases death occurs after from five to seven days. On post-mortem examination there is found to be marked involvement of the intestines, accounting for the dysenteric diarrhœa which is usually present during life, and other mucous membranes, particularly that of the respiratory tract, may be also involved. The disease is inoculable, and when so produced the incubation period is found to be short, usually about forty-eight hours. Protective inoculation with attenuated virus has been tried, but not hitherto with very marked success. The bacteriology of the disease has been worked at with much assiduity of late years, but it cannot be said that the problem has as yet been solved. Much has been done by legislative enactments to prevent the spread of the disease in Great Britain, and the importance of stringent regulations is sufficiently manifest from the fact that the money loss caused by the ravages of rinderpest in 1865–66 in Great Britain was certainly not less than £5,000,000.

Catullus, Gaius Valerius, poet, was born about 84 B.C. in Verona. Little is known of the details of his life. While still a boy, however, he tells us that he played at rhyming. Settling in Rome, he included amongst his friends Cicero, Hortensius, Metellus, and other leading men of the time. He also fell in love with Clodia, the beautiful sister of Publius Clodius Pulcher, and vented his passion in numerous lyrics, which are the best of their time. In the political struggles that subsequently disturbed Rome, he embraced the cause of the senate and fiercely attacked Cæsar and others in his verses. He was seriously affected by the loss of a loved brother towards the end of his own brief career, which ended about B.C. 54. Upwards of a hundred pieces from the pen of this great poet are extant, mostly short. The *Nuptials of Peleus and Thetis* and the *Atys* are the longest and most remarkable. For over three hundred years the text of Catullus was lost. It was recovered at his birthplace in the fourteenth century. Remains of a

villa said to have been his exist at Sirmio, a promontory on the S. of the Lago di Garda, whose beauties he celebrates.

Caub, a town of Prussia, in the province of Hesse-Nassau, is situated on the Rhine. It was here that Blucher's army crossed that river on Jan. 1, 1814. Slate quarrying is the chief industry.

Cauca, a river of South America, in the United States of Colombia; also the name of the largest one of these states covering an area of 260,000 square miles. The river, after a northerly course of 600 miles, flows into the Magdalena.

Caucasians. I. In *Anthropology* the conventional name of one of the main divisions of mankind, for which see CAUCASIC RACE. II. In *Ethnology* the aborigines of the Caucasus, who are grouped (mainly on linguistic grounds) in four divisions: 1. *Southern:* Georgians, Imeritians, Mingrelians, Lazes, Swanithians, Khevsurs Pshavs, collectively forming the *Kartweli* family; 2. *Western*: Circassians, Abkhasians, Kabardians; 3. *Central:* Ossetes or Irons; 4. *Eastern:* Lesghians, Avars, Chechenzes, Ingush, Kist, Tush, Dargo, Kazi-Kumyksh, and many others collectively known as *Daghestani*, a term, however, which simply means "highlanders." These four divisions must for the present be held as fundamentally distinct, all attempts to reduce the several languages to a common mother tongue having hitherto failed. No. 3 (Ossete) belongs to the Aryan stock with Iranian affinities. All the others are strictly indigenous with no known affinities elsewhere. No. 1 certainly, No. 2 probably, and No. 4 very doubtfully, form each a linguistic family, and are sprung from three now extinct stock languages. No. 4 has but slight unity, and in it are often grouped such tribes as the Andi and Ude, whose languages are absolutely distinct from each other and from all others. Even in No. 2 Kabardian differs profoundly, perhaps radically, from both Circassian and Abkhasian, and the Caucasus altogether presents linguistic and racial problems of an extraordinarily complex character. This complexity goes back to prehistoric times, for the Caucasus was already spoken of by the Greeks as the "Mountain of Languages," and Pliny tells us that in his time as many as 120 languages were current in the port of Dioscurias on the Euxine. Apart from Ossete, which being Aryan is inflectional, all the other indigenous languages have this in common, that they belong to the agglutinating order of speech; but in some cases, such as Georgian, Circassian, and Chechenz, the agglutination is so highly developed that the line is not easily drawn between it and true inflection. Some philologists hold even that the line has in several instances been passed. Another common feature is their phonetic system, which is generally characterised by exceeding harshness due to an extraordinary heaping up of consonants, as in *Mtzkhet*, the name of the capital of the ancient Georgian kingdom. To account for the surprising differences prevailing amongst these small upland communities it has been suggested that they are the remnants of several distinct races, who may have in remote times taken refuge in the Caucasian highlands from conquering hordes sweeping over the Russian and Asiatic steppes. The Caucasians have long been regarded as physically, perhaps, the finest branch of the Caucasic type, which, in fact, is named from them. No doubt many, especially of the Circassians and of the Georgian group (Mingrelians and Imeritians), present a magnificent physique, so far justifying anthropologists in accepting them as typical specimens of the race. But great diversity prevails, and some of the hill tribes, such as the Pshavs and Swanithians, have coarse, ill-favoured features, and ungainly figures. The Ossetes also have a far from prepossessing appearance, and many of the highland populations seem to have been degraded from want and hardships in their barren upland valleys. But all without exception present the distinctly Caucasic type, as opposed to the Mongolic of most Asiatics. 3. In *Ethnography* all the inhabitants of the Caucasus, including, besides the aborigines, Mongol, Russian, Armenian, and other intruders, number altogether about 6,270,000 (1890) as under: Southern Caucasians, 904,000; Western Caucasians, 188,000; Central Caucasians (Ossetes with other Iranians), 280,000; Russians, 1,905,000; Armenians, 810,000; Chechenzes, 265,000; Lesghians, 537,000; Mongolo-Tatars, 1,286,000; Jews, Arabs, and other Semites, 30,000; sundries, 70,000. For details see under the several entries.

Caucasic Race, one of the main divisions of mankind, so named by Blumenbach, who regarded the aborigines of the Caucasus as the most typical branch of that division. As contrasted with the other two divisions (yellow, black lank-haired, flat-featured Mongol, and black, woolly-haired, prognathous Negro), the ideal Caucasic man is fair, with light or brown hair and regular features. But two sub-types are distinguished by Huxley and others: the *Xanthochroi* ("fair-coloured"), assumed to represent the true primitive Caucasic stock, characterised by flaxen or light brown wavy hair, dolichocephalic skull (long from occiput to glabella), florid complexion, large, straight or slightly aquiline nose, large blue or hazel eyes, tall stature (mean, 5 feet 8 or 9 inches); and the *Melanochroi* ("dark-coloured"), characterised by black and rather straight hair, brachycephalic skull (short or round), pale or sallow complexion, small nose, black eyes, medium height (5 feet 6 inches). Originally the fair type is supposed to have occupied the higher latitudes, at least in Europe (Scandinavia, North Germany, Baltic provinces), while the dark was grouped round the Mediterranean lands (North Africa, West Asia, South and West Europe, especially Iberia and parts of Britain); but for countless ages interminglings have been incessantly going on, so that at present the great bulk of the Caucasic peoples show almost everywhere endless shades of transition between the two extremes, evident not only in all the great divisions and their minor branches, but even in family circles and in the individual (light hair and dark eyes; florid complexion and black hair often seen in same person). On the ethnical border-lands

both merge imperceptibly in the conterminous Mongolic and Negro types, as through the Finns and Lapps in the north, through the Turkomans in the east, through the Gallas, Somals, and Tibbus in the south. But the average Caucasic man (and in the present mixed state of the human species it is now everywhere a question of averages) can still be easily distinguished from the average Mongol and Negro, both of whom he far excels, especially in his mental qualities. The Caucasic is also the most numerous, the most widespread, and in every respect the leading division of mankind. The Mongols are popularly supposed to be the most numerous, but this is owing to the exaggerated estimates of the population of China (the chief Mongolic domain), and to the common mistake of regarding all Asiatics as Mongols, many millions being really Caucasians. Caucasic speech also belongs mainly to the inflecting, that is, to the highest order, almost the only exceptions being the Basque of the Western Pyrenees, and perhaps most of the idioms spoken by the aborigines of the Caucasus. Apart from these, the three great Caucasic linguistic families (all inflecting) are the *Aryan*, *Semitic*, and *Hamitic*, whose collective domain now comprises most of Southern Asia between the Bay of Bengal and the Mediterranean, nearly all North Africa between Sudan and the Mediterranean, nearly all Europe, a great part of South Africa, most of Australasia, all North and Central America, with but slight exceptions, and by far the greater part of South America. The domain thus comprises about half the population of the globe, say 720,000,000, all of Caucasic speech, but not all of Caucasic stock, as shown by the Aryan-speaking Negroes of the New World, the numerous Finno-Tatar peoples now assimilated in speech to the Aryan Slavs, and so on. Allowing 20,000,000 for these, there still remain some 700,000,000 who belong, both in physical type and speech, to the Caucasic division of mankind. For details *see* ARYAN, SEMITIC, HAMITIC RACES AND LANGUAGES, and CAUCASIANS, II.

Caucasus, a lofty range of mountains in Russia, traverses the lieutenancy of Caucasia from N.W. to S.E., and extends for a length of 700 miles between the Black Sea and the Caspian. It thus forms the boundary between Europe and Asia, which latter country the region more particularly resembles. It is composed for part of its length of parallel chains, connected by elevated table-lands. In the central chain are found the most lofty peaks —Mount Elbruz, 18,572 feet; Koshtan-tan, 17.123 feet; Dych-tau, 16,928 feet; and Kasbek, 16,546 feet. Across Kasbek is the Eng or Dariel Pass, called the Caucasian Gates, whereby Russia has her only carriage communication with her Transcaucasian territories, unless by the Caspian shore. The line of perpetual snow in the Caucasus is 11,000 feet. The rivers that principally drain the range are the Kuban and Rion, anciently *Phasis*, flowing into the Black Sea, and the Terek and Kur, flowing into the Caspian. Some portions produce only grass, though on the whole vegetation is vigorous, especially near the Black Sea, where the slopes are covered with immense forests of oak, beech, maple, ash, and walnut, while in the valleys are grown rice, tobacco, indigo, cotton, hemp, fruits, and various grain crops. The mineral products are extensive, and at Baku on the Caspian are rich petroleum wells. Though there are no active volcanoes in the Caucasus, the region is yet visited by earthquakes, and the principal peaks are evidently of volcanic origin.

Cauchy, AUGUSTIN LOUIS, mathematician, was born in 1789 at Paris. At one time tutor to the Comte de Chambord, he was in 1848 appointed to the chair of astronomy at Paris, but on the accession to power of Napoleon III. he retired, and died in 1857. His *Memoire sur la Théorie des Ondes* afforded a basis for the subsequent development of the undulatory theory of light.

Caucus, the name given to a kind of inner committee that nominates candidates for Parliament, and is supposed to act generally for a constituency or party at large. The name and practice were adopted from America by the advanced Liberal party in Great Britain. There is some dispute about the origin of the name, which appears as early as 1753, in John Adams's diary. Some think it from the Mod. Gk. word *kakos*, a cup, and to have a social club-like signification, while others refer it to a Red Indian origin, since Pocahontas's Captain John Smith uses words somewhat resembling it in reference to Indian councils.

Caudebec, a town of France, in the department of Seine-Inférieure, is named Caudebec-les-Elbeuf to distinguish it from Caudebec-en-Caux, an ancient village in the same department.

Caudex, an unnecessary botanical term applied to the unbranched stems of tree-ferns, palms, and similar arborescent plants.

Caudine Forks, associated with a disastrous defeat of the Romans by the Samnites, 321 B.C., are two ravines in ancient Samnium, and near the town of Caudium.

Caul, a term applied to the amniotic membrane [AMNION], which is sometimes carried before the head of the child at birth. Children born with their heads enveloped in a caul were supposed to be peculiarly lucky, and the possession of such a piece of membrane, whether obtained by accident of birth or by purchase, was supposed by the credulous to confer certain advantages upon the owner. The caul was supposed, for example, to be a certain preservative against death by drowning. Again, it was held that the owner of the caul could inform himself as to the state of health of the person who was born with it, by noting the degree of dryness or flaccidity of the membrane. The market value of a well-preserved caul was considerable up to within quite recent years.

Caulerpa, a large genus of marine Algæ, belonging apparently to the *Siphoneæ*. They occur mostly in warm seas, reach a length of several feet, varying much in form, and are a bright green. The most remarkable feature they present is that, though often differentiated externally into parts resembling

rhizoids or rootlets, stems, and pinnately-lobed leaves, they have no internal divisions or cell-walls, so that they must either be considered unicellular or the cell theory must be admitted to be altogether inapplicable to this and some similarly constituted groups of organisms. Caulerpa furnishes the chief food of some marine turtles.

Cauliflower, a variety of the cabbage (*Brassica oleracca, botrytis cauliflora*) in which an abnormally enlarged, much-branched depressed inflorescence with fleshy branches and abortive flowers is produced. It was in cultivation in England in the sixteenth century, more than a century before the more robust winter variety, the broccoli (*B. oleracea botrytis asparagoides*). Besides its use as a boiled vegetable, cauliflower makes an excellent pickle.

Caulking, or CALKING, the operation of driving oakum, or unravelled rope, between the interstices of a ship's planks or decks, so as to render the whole watertight. Having been driven in, the caulking, for preservative purposes, is covered with hot pitch, resin, or marine glue. Caulking-irons are iron chisels used for the purpose of caulking.

Caura, a river of Venezuela, flows into the Orinoco. It is also the name of a territory covering an area of upwards of 22,000 square miles.

Caus, CAULX or CAULS, SALOMON DE, engineer, was born in 1576 at Dieppe. In a work published in 1615 he describes a mechanism for driving up water by a steam fountain, on which is based by some a claim that he anticipated the invention of the steam-engine. He was architect to the King of France from 1623 till his death in Paris in 1626, having previously been in the service of the Prince of Wales, and of the Elector Palatine at Heidelberg.

Causality, the name given to the relation of one fact or set of facts, to another fact or set of facts, as being necessarily concerned in bringing it or them about. Possibly no point of philosophy has been more disputed than the doctrine of cause and effect. Aristotle arranged causes as Material, Formal, Efficient, and Final. Material and Formal disappeared with the scholastic philosophy (q.v.), and Efficient has passed into the "invariable antecedent" of Hume and Mill: while the final cause—or purpose for which a thing was made or exists—was soon banished at least from the region of physical research, and in this department, seeking the cause of a thing meant little more than looking for an explanation of change. Sometimes cause has been defined as the invariable antecedent conditions of any event, and nothing more, and in general it is taken to mean one or two of these conditions. Later writers upon logic base their doctrines of causation upon two things, the law of universal causation, *i.e.* that every event is preceded by certain other events which determine it or enable it to be known, and the law of uniformity of nature, *i.e.* that similar conditions precede similar events. These laws are held by some to be nothing but observed sequences, by others to be necessary laws of thought. Spencer (*First Principles*) explains at some length that assigning the cause of an event is simply bringing one phenomenon under a wider set of phenomena.

Cause Célèbre (French), a celebrated case, a term applied by the newspapers to a sensational trial.

Causerie, literally *a chat*, is a name given to a short and informal essay or discussion upon any subject or set of subjects; and is generally of a more rambling, discursive nature than the essay proper.

Caustic (Gk. *burning*). Caustics or escharotics are used to burn away living tissues in cases where some poison has obtained entrance to a wounded surface. Thus in dog-bites it is a common practice to apply caustic in the hope of preventing the possibility of the development of hydrophobia. Indolent ulcers are sometimes touched with caustic to stimulate the tissues in the hope of accelerating healing. The principal caustics are potash, soda, lunar caustic (nitrate of silver), chloride of zinc, arsenical paste, and acid nitrate of mercury. Caustic, in *Optics*, is the bright surface or curve formed by reflected or refracted rays of light under special conditions. [OPTICS.]

Cautery (Gk. *a branding - iron*). The old classification of cauteries is into actual and potential. The potential cautery is a stick of caustic (q.v.), the actual cautery is a hot piece of metal. The actual cautery is used in surgery as a counter-irritant, and as a means of checking hæmorrhage. In its simplest form it consists of a piece of iron which is made white hot in the fire; in the benzoline or Paqueline's cautery the surgeon possesses a useful instrument, the heat of which admits of regulation by working a spray-producer, which drives a stream of benzoline vapour between heated platinum surfaces. The heat of the cautery varies with the rate at which the vapour is made to ignite. In the galvano-cautery a galvanic current is caused to heat a platinum wire. Paquelin's and the galvano-cautery are often used in operations upon structures which bleed readily, and in which it is difficult to control bleeding points by ligature or torsion.

Caution, a term in Scots law equivalent to "Guarantee" in England, whereby a third party to any contract undertakes to fulfil the obligations of the second party (the obligee). On this subject the law of England and Scotland has been amalgamated by the "Mercantile Law Amendment Act" passed in the year 1856, and under which a creditor is entitled to proceed at once against the cautioner as if he were a joint obligant, and without suing the principal obligor or debtor. The cautioner is at liberty to set up any defence which was competent to the principal debtor. The cautioner in the event of any important change in the debtor's obligation, made without his (the cautioner's) assent, is discharged. Changes of partnership, either of creditor or debtor, have the effect of cancelling the guarantee; so also will time given to the debtor without the cautioner's consent; and the discharge of one cautioner (if there be several), without consent of the others, operates as a

discharge to all. The cautioner on full payment of the debt is entitled to an assignment of the same, with all securities therefor in the hands of the creditor, and, in fact, takes his place against the original debtor or obligor.

Cavaignac, Louis Eugène, was born in 1802 at Paris. Prepared for the military profession, he served in the Morea, and on the breaking out of the Revolution in 1830 he rather hastily pronounced in favour of it, for which he was sent to Africa into honourable exile. There he distinguished himself by his valour, and by 1844 had risen to the rank of brigade-general; in 1848 he was appointed governor-general of Algeria, but in view of the threatening state of affairs, was recalled to Paris, and made minister of war. When, in June, the insurrection broke out, he was appointed military dictator. For three days, from June 23rd to the 26th, the streets of Paris presented terrible scenes of carnage. At last, however, order was restored, and Cavaignac resigned his dictatorial power into the hands of the national assembly. Towards the end of the year he became a candidate for the presidency of the republic, but Louis Napoleon was preferred. After the *coup d'état* of December, 1851, he was arrested, but though he refused to own allegiance to the empire, he was soon liberated. He was twice elected to the legislative assembly, but refusing to take the oath, was incapacitated from serving. He died in 1857 near Tours.

Cavalcanti, Guido, poet, was born in 1230. He suffered banishment by his party, the Ghibellines, and in broken health came back to Florence to die. He was a friend of Dante, and wrote beautiful ballads and sonnets.

Cavalcaselle, Giovanni Battista, was born in 1820 at Legnago. He is chiefly known through the works written jointly with J. A. Crowe, whom he first met in Germany. These are *Early Flemish Painters*, *History of Painting in Italy*, *Titian*, and *Raphael*. He occupies the position of chief of the art department under the minister of public instruction in Rome.

Cavalier (from Lat. *caballus*, a horse) formerly denoted simply a horseman; then, as riding became almost the privilege of the upper classes, it denoted a knight, and later a gentleman. The adherents of Charles I. called themselves cavaliers. In some connections the word is absurdly used, but not in good English, to denote anyone in attendance upon a lady, especially in dancing. The word is still used by the French in its original sense. It was formerly used in fortification to denote an inner defence that overtopped and overlooked the outer works.

Cavalry, troops designed to fight principally on horseback. Under the feudal system every holder of land was assessed at a "knight's fee," whereby he was "required to provide a charger, a coat of mail, a helmet, shield, and lance," and either he or his deputy had to serve the Crown a period of forty days in any year at his own expense. The cavalry of a mediæval army consisted of those knights and men-at-arms, and Hobiliers, or inferior horsemen, who bore the brunt of the battle; the infantry being accessories. But the introduction of gunpowder changed the rôle of the mounted arm, and it became auxiliary to the infantry. The "men-at-arms" with complete armour gave way to the "spears and launces" in the reign of Mary, and when the lance fell into disuse, the cavalry were designated "Horse," and were generally cuirassed. They were armed then with swords and a pair of pistols or petronels; and as the musket improved, so another mounted "arm," the "dragoon" —destined to become true cavalry later on—was introduced. He was at first merely a mounted infantry man, armed with the infantry musket, the "Horse" then carrying a lighter carbine. Eventually the armament of both assimilated, and during the early part of the eighteenth century there was no practical difference between them either in their work or equipment. In the British army the regiments of "Horse" were reduced to Dragoons in 1746; but to distinguish them from the original dragoon regiments they were given the title of "Dragoon Guards." Finally, light dragoons were generally added to the establishments of most armies, and these were eventually changed into "Lancers" and "Hussars," the former being armed with lances, the dress of the latter being changed. At present the cavalry of an army is divided into heavy regiments, such as 1st and 2nd Life Guards, the Horse Guards, and the 1st and 2nd Dragoons; medium, the Dragoon Guards; and light, as the Hussars and Lancers. With the exception of the Lancers, who carry the lance in addition, the whole of the British cavalry is armed with sword and carbine; but it is proposed to furnish the front rank of all cavalry with the lance. A cavalry regiment consists of four squadrons, each of two troops, and numbers about 400 men. The weight carried by the horse varies from eighteen to twenty-two stone.

Cavan, a county of Ireland in the south of Ulster, covers an area of about 750 square miles, 200 of which are under cultivation, the chief crops being potatoes, oats, and flax. Coal and iron are found in the county, and linen is manufactured. The chief rivers are the Annalee, Erne, and Woodford, and the towns Cavan, Cootehill, and Belturbet. Cavan is similarly the name of the county town, which is situated on a tributary of the Annalee. Besides a school, founded by Charles I., it has also a Roman Catholic college.

Cavatina, in *Music*, a term now applied indiscriminately to any kind of aria; it originally signified, however, a melody of a smooth character, simpler than the aria and with no repetitions.

Cave, a hollow extending beneath the surface of the earth. Natural caves may originate in the expansive force of volcanic gases, as in the Grotto del Cane, near Pozzuoli, in which carbon-dioxide still escapes from crevices in the floor; or in the erosive action of sea-waves and of the compression of air that they produce, as in Fingal's Cave, hollowed out of the columnar basalt of Staffa; or in the solvent action of water charged with carbon-dioxide acting along joints in limestones. Some of these latter, such as the Mammoth Cave of

Kentucky, and those of Adelsberg, extend for many miles, branching into innumerable chambers. Streams of water may still traverse them, or the subterranean drainage having been deflected, the floors of caves may be dry and suitable for occupation by man or animals. Caves have been used in all ages by man as dwellings, as refuges, or as tombs. In those in the Cretaceous limestones of Perigord the remains of an Esquimaux-like race, using rude (*palæolithic*) flint-implements have been found, together with the bones of the animals they hunted, including the extinct mammoth, and cave-bear, and the reindeer, these bones being sometimes incised with graphic outline representations of the animals when alive. Many caves in Wales, France, and Spain yield remains of men of an Iberian or Basque race, who used polished stone (*Neolithic*) implements. The temporary sojourn of Lot and of David in caves, and the burial-cave of Machpelah are instances that may be cited from Holy Writ. Articles of the Bronze Age and others coming down to the fifth century have been found in caves in Britain, whilst in Arabia, China, and Central Africa many people still lead an underground life. The dark recesses of caverns and their use as refuges by conquered races have in most countries associated them with much legendary lore of oracles, sibyls, nymphs, fairies, sleeping heroes, and entrances to the nether world. [BONE-CAVES.]

Cave, EDWARD, printer, was born in 1691 at Newton, Warwickshire. In 1731 he founded the *Gentleman's Magazine*, the earliest journal of its kind. In 1740 Johnson became parliamentary reporter to it. Cave was the first to give Johnson literary work.

Caveat, a process formerly in use in the Spiritual Court, now used in the Court of Probate to prevent or stay the proving of a will or the granting of administration to a deceased person's effects. When a caveat is entered against proving a will or granting administration, a suit usually follows to determine either the validity of the testament or who has a right to administer. The claim or obstruction by the adverse party is, in the event of its being unfounded, an injury to the person entitled, and as such is remedied by the decision of the Probate Court either establishing the will or granting the administration. A caveat is also in use in Chancery proceedings against enrolling a decree where it is intended to appeal to the full court, because after enrolment the only appeal is to the House of Lords. Since the Judicature Act, 1873, the distinction has become of less importance.

Caveat Emptor (*let the buyer beware*), a maxim of law applicable to a sale of goods and chattels under, or according to, which a vendor is not bound to warrant the goodness of the wares he sells, *unless* he expressly and in terms *does so*, or unless he knows them to be otherwise and uses any art to disguise them, and this is so although the price is such as is usually given for a sound commodity. Every statement, however, made by the vendor at the time of sale *is* a warranty if it appear to have been so intended.

Cave Bear (*Ursus spelæus*), a gigantic extinct species of bear, surpassing the Polar bear in size and apparently closely related to the grizzly bear, the bones of which are found fossil in the Cromer Forest-bed (*Pliocene*), and in cave-deposits (*Pleistocene*) in England, Europe, and Asia.

Cave-lion (*Felis spelæa*), a fossil lion found in Cave-deposits (Pleistocene). It was larger than, but specifically identical with the lion (q.v.).

Cavendish, LORD FREDERICK CHARLES, second son of the seventh Duke of Devonshire, was born in 1836, and educated at Trinity College, Cambridge, where he graduated B.A. in 1858. Becoming private secretary to Lord Granville in 1859, he was returned in 1865 for the West Riding of Yorkshire, which he represented until his death. He succeeded Mr. Forster as Chief Secretary for Ireland, but a few days after his appointment in 1882, he, with Mr. Burke, an assistant secretary, was murdered by the "Invincibles."

Cavendish, GEORGE, author, was born in the beginning of the sixteenth century. In 1527 he entered the service of Cardinal Wolsey as his gentleman-usher. After the cardinal's fall he retired to Suffolk, where he lived with his wife, a niece of Sir Thomas More. He retained a strong affection for his late master, and wrote his biography, one of the most interesting productions of its kind in the English language.

Cavendish, HENRY, chemist and philosopher, son of Lord Charles Cavendish, and nephew of the third Duke of Devonshire, was born in 1731 at Nice. Though a man of great wealth, he lived in seclusion, devoting himself to scientific researches. In 1760 he discovered the levity of hydrogen, thus preparing the way for ballooning. He also found out the composition of water, and measured the density of the earth. He was distinguished for the accuracy of his processes, and is sometimes spoken of as the Newton of Chemistry. His writings are confined to papers in the *Philosophical Transactions*. He was a man of extraordinary shyness, and was so averse to meeting anyone that he had his magnificent library four miles from his residence, so as not to encounter any one coming to consult it. He never married, and died in 1810 at Clapham, leaving over a million sterling.

Cavendish, THE RIGHT HON. SPENCER COMPTON, DUKE OF DEVONSHIRE, MARQUIS OF HARTINGTON, was born in 1833, and educated at Trinity College, Cambridge, graduating B.A. in 1852. He first entered parliament in 1857, representing North Lancashire in the Liberal interest, and first took office as a Lord of the Admiralty in 1863. From that year until 1866 he was Secretary for War, and in 1868, losing his seat for North Lancashire, he was soon after returned for the Radnor Burghs, when he was appointed Postmaster-General. He held that office until 1871, and then became Chief Secretary for Ireland until 1874. On Mr. Gladstone's temporary retirement from the leadership of the Liberal party, Lord Hartington was chosen in his place. At the general election of 1880 he was returned for the

Radnor Burghs and for N.E. Lancashire, the latter of which he elected to sit for. In 1886 he dissented from Mr. Gladstone's Home Rule policy, and thenceforward became leader of the Liberal Unionists. He succeeded to the dukedom in 1891.

Cavendish (or CANDISH), THOMAS, one of the greatest of the Elizabethan navigators, was born in Suffolk about 1555; and in 1586 left England in command of an expedition which met with great success against the Spaniards, and which, having circumnavigated the globe, returned in 1588. Cavendish had previously served under Sir Richard Grenville against the Spaniards in the West Indies. In 1591 he sailed on a second voyage round the world, with the *Leicester*, *Roebuck*, *Desire*, *Dainty*, and *Black Pinnace*. He met with continuous disaster, lost all his ships save one by wreck or desertion, and died at sea, probably early in 1593.

Cavendish, WILLIAM, DUKE OF NEWCASTLE, son of Sir Charles Cavendish, was born in 1592, and educated at St. John's College, Cambridge. Becoming a favourite at court, he was made Earl of Newcastle by Charles I., whom he strongly supported against the Parliamentarians. He was appointed general of all the King's forces raised north of the Trent, with power to issue edicts, confer knighthoods, coin money, etc. After the royal cause became hopeless, he retired to the Continent, where he remained until the Restoration, when he was rewarded with a dukedom. He wrote several plays and a treatise on horsemanship.

Cavendish Experiment, a method devised by Michell, and improved by Henry Cavendish, to determine the constant of gravitation; that is, the force with which unit mass attracts unit mass when the two are placed at unit distance apart. A knowledge of this enables us to calculate the mass of the earth. Two spheres of equal mass are suspended from the ends of a thin horizontal rod, supported at its centre by a fine vertical wire. Two larger spheres are placed so as to turn the horizontal rod by attracting the smaller masses, and the time of oscillation of the rod is observed. This and a few data of the different positions of the rod are sufficient to determine the required constant. Baily's experiments gave it the value $6{\cdot}48 \times 10^{-8}$ with the ordinary absolute units; the mass of the earth is then $6{\cdot}14 \times 10^{27}$ grammes, or about 5×10^{24} tons, and its mean density 5·67 as compared with water. The Cavendish experiment is being repeated with much greater accuracy and on a much smaller scale by Professor Boys. [GRAVITATION.]

Caviare, a word of Tartar origin, denoting a food or relish made of the salted roes of sturgeon and other allied fish, especially the sterlet. Most of the caviare used comes from the fish of the Black Sea and the Caspian, and the rivers flowing into them. It was formerly a great luxury, as Shakspeare's "caviare to the general" denotes; and the use of it is not very widely spread even now. It is worthy of remark that the Russians themselves do not call it caviare, but *ikra*.

Cavour, COUNT CAMILLO BONSO DI, statesman, was born in 1810 at Turin. At the age of sixteen he was appointed sub-lieutenant in the Engineers. His liberal sympathies, however, led him to incur the displeasure of the authorities, and in 1831 he resigned. He came to England and spent several years in studying the British constitution, and making valuable friendships, his object being the regeneration of Italy. At length he thought the time had arrived for more direct action, and in 1847 he established the *Risorgimento*, a newspaper, in which he advocated the principles of representative government. He took the lead in getting the king to grant the Constitution of 1848, and he himself was returned as one of the representatives for the Capitol. After the battle of Novara he, having counselled peace, rose in popularity, and became successively Minister of Agriculture and Commerce, Minister of Marine, and Minister of Finance. In 1852 he succeeded to the premiership, and henceforth till his death, excepting a brief period, was the first minister and ruler of his country. His policy throughout was designed to accomplish the unification of Italy (q.v.), which he lived to see practically realised; for in 1861, the year of his death, an Italian parliament met, and Victor Emmanuel (q.v.) was proclaimed King of Italy.

Cavy, any species of Cavia, a genus of rodents, of which the Guinea-pig (q.v.) is the type.

Cawnpore, a city in the North-West Provinces of India and capital of the district of the same name, is situated on the right bank of the Ganges, about 1,000 miles from the sea. It is a modern town with extensive military cantonments, and as regards industry is noted for its gloves, jewellery, and leather work. British property since 1801, it is associated with one of the cruellest episodes in the annals of the Indian Mutiny (q.v.) of 1857. It then contained about 1,000 Europeans, more than half of whom were women and children, and General Wheeler was in command. The Europeans being outnumbered by the mutineers under the Rajah of Bithoor, better known as Nana Sahib, surrendered under promise of a safe conduct to Allahabad. Just as they had embarked, the natives fired on them and carried the survivors back to Cawnpore. Here, when the news of General Havelock's approach arrived, they were massacred, their bodies being thrown into a well. Over this well is now a mound crowned with an octagonal Gothic structure, and round it are public gardens. A memorial church also marks the site of General Wheeler's entrenchment. The district of CAWNPORE covers an area of 2,336 square miles, and besides its capital has the towns Bilhour, Bithoor, and Akberpoor. It is a fertile region, and produces the vine and the indigo plant.

Caxias, (1) a town of Brazil, in the province of Maranhao, is situated on the Itapicura; (2) an Italian colony in Brazil, province of Rio Grande do Sul, was founded in 1875, and is mainly engaged in agriculture.

Caxton, WILLIAM, first English printer, was born about 1422 in the Weald of Kent. He began as an apprentice to a London mercer, Robert Laye, who was Lord Mayor 1439–40, and was

successful, having gone into business for himself at Bruges. In 1471 he gave up commerce and became attached to the household of Charles, Duke of Burgundy, whose wife Margaret, sister of Edward IV., was subsequently Caxton's patron. He had acquired the art of printing while at Bruges, where in 1474 he printed the first book in the English language, viz. *Recuyell of the Historyes of Troy*, and in 1476 he returned to England, and in the following year printed the *Dictes and Sayings of the Philosophers*, the first book printed in England. Another early book of Caxton's was the *Game and Playe of the Chesse*. He was a remarkably industrious man, and an accomplished linguist. He died in 1491.

Cayenne, the capital of French Guiana, is situated on Cayenne island at the mouth of the Cayenne river. Since 1852 it has been a great French penal settlement. The climate is unwholesome, especially for Europeans.

Cayenne Pepper is manufactured from the ripe fruits of various species of *Capsicum* (q.v.). They are dried, ground, mixed with flour and yeast, and baked into hard cakes which are re-ground. Red lead, vermilion, ochre, salt, rice-flour, and turmeric are occasional adulterants of cayenne pepper. It is employed in medicine, chiefly as a stimulant in dyspepsia. In large quantities it acts as an irritant poison.

Cayley, ARTHUR, mathematician, was born in 1821 at Richmond, Surrey, and graduated as senior wrangler and Smith's prizeman in 1842. After practising at the law, he was in 1863 appointed Sadlerian professor of pure mathematics at Cambridge, and in 1875 fellow of Trinity College. He is a member of the leading scientific societies, and in 1883 was president of the British Association. Among his works is *An Elementary Treatise of Elliptic Functions.*

Caylus, ANNE CLAUDE PHILIPPE DE TUBIÈRES, COMTE DE, archæologist, was born in 1692 at Paris. After some military service in the Spanish succession war, and extensive travelling, he returned to Paris in 1717. Henceforth he devoted his attention to the study of antiquities, and became an accomplished engraver. His chief work is his *Recueil d'Antiquités Egyptiennes, Etrusques, Grecques, Romaines, et Gauloises.* He died in 1765 in Paris.

Cayman, the popular spelling of the name of any individual of the genus or sub-genus Caiman. [ALLIGATOR.]

Ceara, a province on the N. coast of Brazil, covers an area of about 50,000 square miles. An important industry is cattle-raising, and amongst its products are gums, medicinal plants, coffee, cotton, and the sugar cane. The capital is also named Ceara, and does an important trade in the products of the district.

Cebes, a disciple of Socrates, was reputed the author of the *Pinax*, a dialogue somewhat after the nature of the *Pilgrim's Progress*, and allegorically representing the temptations that beset the path of life. Some critics assign it to a later period than Socrates' time

Cebidæ, a family of monkeys comprising all the forms found in the New World, and therefore equal to the obsolescent group, Platyrrhini. [APE.]

Cecidomyidæ, a family of flies known as the Gall Gnats, and including the Wheat Midge (q.v.) and the Hessian Fly (q.v.). Many species exhibit the phenomenon of alternation of generations, as the larvæ at certain seasons are produced from larvæ instead of from adults. They belong to the order DIPTERA, under which a summary of the characters is given.

Cecilia, ST., the patron saint of music, is said to have suffered martyrdom in the year 230 A.D. Becoming converted to Christianity, she refused to offer sacrifices to idols, and for this was condemned to death. She is also credited with being the inventor of the organ, and in the Roman Catholic Church her festival, November 22nd, is musically celebrated. Her story is the subject of one of Chaucer's *Canterbury Tales;* Dryden and Pope have also sung in her honour. Painters, too, have depicted her, the most celebrated being Raphael, Dolce, Domenichino, and Rubens.

Cecomorphæ, a group of birds, in Huxley's classification, containing the gulls.

Cecrops, the traditional founder of Athens, and first King of Attica, is said to have implanted the germs of civilisation amongst the rude inhabitants. He is also mentioned as the leader of a colony about 1400 B.C. to Attica from Sais in Egypt.

Cedar, the popular name of a variety of trees, mostly agreeing in having a reddish-brown aromatic wood. The coniferous genus *Cedrus* includes

CEDAR. (*Cedrus Libani.*)

only four forms, all native to the Old World:—*C. Deodara*, the deodar of the Himalayas; *C. Libani*, the cedar of Lebanon and Taurus; *C. Libani*, var. *brevifolia*, of Cyprus; and *C. atlantica*, the Algerian, or Mount Atlas cedar. *Cedrus* has its needle-like leaves fascicled, like the larches; but unlike those trees, evergreen, so that they remain on the tree for several years after the dwarf-shoot

has elongated. Its cones are erect, with broad, thin-edged scales which ultimately fall away from the axis, as in the firs (*Abies*). *C. Libani* has horizontal; *C. Deodara*, drooping; and *C. atlantica*, ascending, branches; but otherwise there is little difference between these geographical races. The Lebanon cedar seems to have been introduced into England about 1670; the deodar in 1822. Among the oldest and finest cedar trees in England is one at Enfield, Middlesex. The wood is durable, and, if not very long-lived, the tree suggests strength by its form, and this is probably the origin of its Semitic name, as it is also at the root of most of the figurative allusions to it in Holy Scripture (Ezekiel xxxi., etc.). Martin frequently introduced the level lines of cedar boughs by the side of Assyrian architecture in his pictures. The wood of *Juniperus bermudiana* is known as pencil cedar, and that of *J. virginiana* is also used in making lead-pencils. *Cedrela odorata*, an angiospermous tree, native to the West Indies, yields the wood known as Honduras, Jamaica, or Barbadoes cedar, used for cigar boxes.

Cedar-bird (*Ampelis cedrorum*), a common North American bird, allied to the Waxwing (q.v.). The plumage is a soft cinnamon, both sexes are crested, and there are red horny appendages on the secondaries of the male.

Cedar Rapids, a town of the United States in Iowa, situated on the Red Cedar river. It is an industrial place, and an important railway centre.

Cedilla (Fr. *cédille*), a mark ¸ placed under the French c, to signify that it has the sound of s. The name is a diminutive of that of the Greek letter Zeta (ζ), which was at one time written after the c for the same purpose.

Cefalu, a seaport town of Sicily, is situated on the N. coast. The seat of a bishop's see, it has a cathedral. Its main industry is fishing. It has also some marble quarries.

Ceglie, a town of Southern Italy, is not far from Taranto. Grain and fruit are among the chief articles of its trade.

Ceiling (from Latin *cælum*, heaven, thence a canopy, or from Latin *cælo*, to carve—according to Dr. Murray, probably the former), the inner roof or upper surface of a room, whether plain or carved, level or domed. It is often papered, painted, or decorated with plaster work.

Celandine, from the Greek *chĕlidŏn* a swallow, is the popular name for two very different British plants, *Chelidonium majus*, and *Ranunculus Ficaria*. The former, the Greater Celandine, is a glaucous plant with pinnately-lobed leaves, yellow flowers with four petals, a pod-like fruit, and an abundant orange juice, belonging to the poppy tribe. Its juice was used in ophthalmia, an application traditionally alleged to have been discovered by swallows. It is also a rustic remedy for warts and corns; but the corn-cure, now sold under this name, is a preparation of salicylic acid, collodion and Indian hemp, having nothing to do with the plant. *Ranunculus Ficaria*, the Lesser Celandine or pilewort, one of the commonest and earliest of British flowers, was a favourite with the poet Wordsworth, on whose monument at Grasmere, however, Woolner, the sculptor, has erroneously represented the *Chelidonium*. The Lesser Celandine has three deciduous sepals, and nine pointed golden petals; its leaves are simple, heart-shaped, obtuse and glossy; and its roots are many of them tuberculate, whence, in accordance with the doctrine of signatures (q.v.), the plant was looked upon as a remedy for hæmorrhoids and obtained one of its familiar names.

Celaya, a town of Mexico, in the state of Guanajuato, is situated on the Rio Laja. It has manufactures in woollens and cottons, and was the scene of a dreadful catastrophe on Easter Sunday of 1888, when its bull-ring took fire.

Celebes, the third largest island of the Indian Archipelago, has Borneo on the W., and the Moluccas on the E. Covering an area of about 70,000 square miles, it practically consists of four long mountainous peninsulas, running easterly and southerly and enclosing three gulfs, Gorontalo, Tolo, and Boni, and no part of the island is more than 50 miles from the sea. There are several active volcanoes, especially in the north. In the south and east are wide forests and grassy plains. It is plentifully supplied with lakes, and though its streams are numerous none of them are of any magnitude. Among its products are gold, copper, tin, sulphur, diamonds, iron, and salt. It yields tea, coffee, rice, sugar, tobacco, pepper, cloves, nutmegs, indigo, areca, betel, and various woods and oils. Trepang and turtle are extensively caught. It has also various species of animal peculiar to the island—a tailless baboon, the babiroussa (q.v.), starlings, and magpies. It is without representatives of the feline or canine animals or insectivora. Though there are numerous small native states on the island, it is practically a Dutch possession. It was taken by the British in 1811, but a few years later they returned it to the Dutch, whose connection with it dates from 1660.

Celeomorphæ, a group of birds in Huxley's classification, containing the Woodpeckers and Wrynecks.

Celery, *Apium graveolens*, a British biennial umbelliferous plant, common near the sea. It has a strong, disagreeable smell, and is acrid and dangerous to eat when green in its wild state. In cultivation it is generally blanched by earthing up, and the leaf-stalks then form a favourite salad or are eaten stewed. Its fruits contain a larger proportion of the essential oil or essence of celery than the rest of the plant; but this essence is now prepared artificially. There are two races of celery, the red-stalked and the white-stalked, each comprising many varieties; whilst *celeriac* or turnip-rooted celery is a very distinct form, cultivated for the sake of its root in France and Germany. Celery is recommended as an anti-rheumatic.

Celeste, MADAME (1814–1882), a French dancer and actress, who passed most of her life in England and America. After studying dancing at the Royal

Academy of Music at Paris, at fifteen years old she went to the United States and met with much success. She there married a Mr. Elliot, and in 1830 she was in England, and played at Liverpool the part of Fenella in *Masaniello*. In 1834 she returned to America and was enthusiastically received, was made a citizen of the United States, and presented by President Jackson to his cabinet. In 1837 she came back to England, and abandoned dancing for acting, appearing first at Drury Lane and then at the Haymarket, and becoming manager of the Adelphi in 1844. She paid another visit to America (1865–68), and retired from the stage in 1874.

Celestine, a naturally occurring sulphate of strontium, $SrSO_4$. It crystallises in white translucent, or transparent prisms of the rhombic system, or may occur in fibrous or granular masses. It is very brittle, and has a sp. gr. 3·9. It is found in a few localities in England and Scotland, in the Tyrol, Hungary, Pennsylvania, and Strontian Island; and is frequently associated with gypsum and rock salt, and, in volcanic regions, with sulphur.

Celestine, the name of five popes, the most notable of whom was Celestine V. (Pietro Morone), who, after being a hermit for sixty years, and founding the Order of Celestines, was, against his wish, elected Pope, an office for which he felt himself entirely unfitted. In a few months he abdicated, and his successor, Boniface VIII., put him in prison till his death, which happened in the next year.

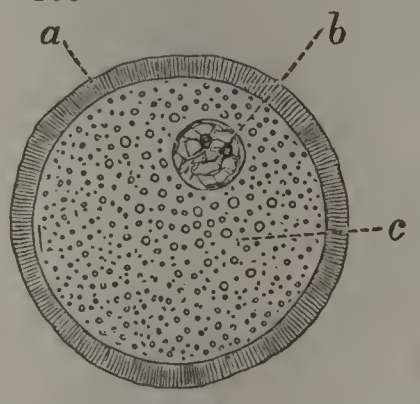
Celibacy, the state of being unmarried; but the term is generally applied to the state of forced abstention from marriage under sanction of an oath, and of punishments incurred by those who marry. It is by no means confined to Christianity; the Romans had their vestal virgins, and the Buddhist priests are celibate. It arose gradually as a practice in the Christian Church. The Scriptures in some places give a high place to virginity as the better state for those who feel a call to it, and in the second century it had grown into a pious custom. In the fourth century it was discouraged after ordination, and in 305 the doctrine was inculcated that priests should live in continence, although married. Hildebrand (Pope Gregory VII.) in the twelfth century declared the marriage of priests sinful and invalid. But the doctrine was vigorously resisted by the priests, and, though the name of wife was refused to the priest's consort, his retention of her was winked at and often made the occasion of extorting a tax from the priest on account of his *focaria* or hearth-mate. Clerical celibacy is now of almost universal requirement in the Roman Church, except in the part of the Eastern Church which acknowledges the jurisdiction of the Pope, where priests are allowed to retain wives married before ordination. But married priests cannot become bishops.

Cell. *Zoology.* A cell is the simplest structural element entering into the composition of all living beings. Animals may consist of one separate cell, as in the PROTOZOA; or of many cells, as in all METAZOA. A cell consists of two constituents, *protoplasm* and a *nucleus*, to which a cell wall is usually added. The protoplasm is really the essential part of a living cell. (For its composition, etc., *see* PROTOPLASM.) It is usually in two distinct layers, a clear, firm ectoplasm and a more fluid, granular endoplasm, containing food and oil materials. The nucleus is composed of a material known as *nuclein* or chromatin, arranged in a spiral or net, or as scattered granules, between which is the "nuclear fluid." The nucleus is an essential constituent of a true cell; when it is absent the structure is known as a "cytode." The simplest form of cell envelope is a mere hardening of the external layer of protoplasm produced by its dehydration; this is seen in some of the Amœbæ. In higher forms it is a definite cuticle, which may be often protected by a shell of varied composition. Among the Protozoa there are various types of cells, for which *see* PROTOZOA. Among Metazoa cells are still more varied, and build up all the complex tissues of higher animals. It is comparatively rare for the cells of animals to be limited externally by the hard, firm envelope of cellulose typical of plant cells; but in many cases it is impossible to say whether the cells are to be regarded as animals or plants: *e.g.* the "amœbulæ," which form one stage in the life history of the MYCETOZOA, or the "flagellulæ" of Proteomyxa. [GERMINAL CELLS, SPONGE.]

Botany. If we cut a cross-section of the young stem of a herbaceous plant and examine it even with a low power of the microscope, we see a mesh-like, or netted, chambered structure. A longitudinal section will be similar, though the chambers or cavities, filled with liquid contents, may be somewhat elongated. Robert Hooke, in 1667, compared this structure to a honeycomb, and first gave the name of cells to these chambers. The labours of Malpighi and Grew (1670) added much to our knowledge of the internal structure of plants; but, as was natural, these early observers took the solid wall of the cell to be the first-formed and most important part. Caspar Wolff, in the eighteenth century, maintained that the bodies of living beings are composed of minute constituent units all alike in early life and gradually differentiated into tissues; and in 1755 Rösel von Rosenhof, in his account of the "Proteus animalcule" (*Amœba*), gave the earliest description of what we now know as living protoplasm (q.v.). In 1772 Corti described the rotation of the contents of the cell in *Chara* (q.v.), and Meyen, that in *Vallisneria* (q.v.) in 1827. In 1835 Johannes Müller pointed out the existence of cells like those of plants in the notochord of vertebrate animals, and in the same year Dujardin carried out his important researches into that substance in the Foraminifera, for which he proposed the term "sarcode." Robert Brown's discovery of the nucleus in vegetable cells led to the recognition of the importance of that structure, and in 1838 Schleiden traced back the life-history of every plant to a single nucleated cell, and referred all the vegetable tissues to the cellular type. A year later Schwann extended this cell-theory of structure to animals, and in 1846 Hugo von Mohl discriminated the "tough, slimy, granular, semi-fluid"

protoplasma, or first-formed substance, from the watery cell-sap. It was found, however, that animal cells and many free-swimming vegetable cells (ZOOSPORES) were destitute of the cell-wall, so characteristic of ordinary plant-cells; that the cells of cork and wood, which had lost their protoplasm, had ceased to have any active vital functions; and in fact, as pointed out by Max Schuttze, between 1854 and 1861, that, whilst Dujardin's animal sarcode is practically identical with Von Mohl's vegetable protoplasm, this substance is, as Professor Huxley termed it, "the physical basis of life," and we must replace the original idea of a cell, as a closed sac of membrane with a nucleus and fluid contents, by that of a unit mass of nucleated protoplasm. This botanists now generally term a primordial cell. In most cases it soon forms for itself a cell-wall, or becomes "encysted." In a number of the lowest plants single cells are capable of leading an independent existence, and perform all the vital functions, reproducing themselves either by bipartition, by sending out buds or even by conjugation. The "daughter-cells," resulting from one or more bipartitions remaining united, form a simple transition to colonies (*cœnobia*), cell-filaments or tissues, from *unicellular plants*, that is, to multicellular ones. To some of the lower plants, however, no cell-theory can be applied without violence. The unencysted Myxomycetes (q.v.), and the large alga *Caulerpa* (q.v.), which has rhizoids, stems, and leaves, but no internal cell-partitions, are cases in point. In a typical young plant-cell the wall is thin and is completely filled by the contents, whilst the nucleus appears large relatively to the protoplasm. As the cell gets older the wall becomes thicker, the protoplasm becomes "vacuolated" by drops of watery "cell-sap," and the nucleus, remaining comparatively unchanged, appears relatively smaller. When the cell is mature, the cell-sap has often pushed the protoplasm to the sides, so that it forms a mere film, once termed the *primordial utricle*. The cell-wall consists mainly of cellulose (q.v.), $x\ C_6H_{10}O_5$; but is possibly in all cases permeated by protoplasmic threads. In many of the higher plants the cavities of cells communicate by perforations. The cell-wall may, by saturation with *lignin*, *cutin*, or *mucin*, compounds richer in carbon than is cellulose, become converted into wood, cork, or mucilage respectively. The nucleus, apparently present at some time in all vegetable cells, is undoubtedly of great physiological importance. It generally divides before the cell undergoes division: if, in some algæ, it escape with some protoplasm from a broken cell, it may give rise to a new plant; and, as long as it remains, some protoplasm adheres round it. It has a delicate "nuclear wall," and differs from the protoplasm in its composition, apparently containing more phosphorus. The cell-sap is mainly water, but will contain sugar, dextrine, inuline, acids, or any other soluble substances that may be present in the cell. Besides the protoplasm, nucleus, and cell-sap and these soluble and, therefore, invisible substances, the cell may contain various granular bodies, such as aleurone-grains (q.v.), starch-grains (q.v.), and *plastids*, of which the principal are *chloroplastids*, or chlorophyll-corpuscles (q.v.), *leucoplastids* (q.v.), and *chromo-plastids*, or granules with less soluble colouring-matters. Needle-like or other crystals of calcium-oxalate or carbonate may also occur. [RAPHIDES.] Vegetable cells range in size from ·001 millimètre up to a length of nearly two inches, as in the hairs of cotton.

Physiology. The human body with all its complexity of structure takes its origin from a single cell; every tissue of which the body is composed is made up of cells (more or less modified) the descendants of this original ovum. An idea of what a cell is may be obtained from a brief consideration of the mammalian ovum. It is a more or less spherical, semi-transparent, granular-looking body, from $\frac{1}{100}$ to $\frac{1}{200}$ inches in diameter. The substance of which it is composed is called *protoplasm* (q.v.), it is limited externally by a membrane called the zona pellucida, and contains, embedded within it, a distinct globular mass, known as the *germinal vesicle*. Substituting for the special term germinal vesicle the word *nucleus*, and neglecting the outer limiting membrane, we arrive at the conception of a typical animal cell.



RIPE OVUM OF CAT.
a, Zona pellucida; *b*, germinal vesicle; *c*, protoplasm.

The modifications such nucleated masses of protoplasm undergo in the making of the fully-developed human body are innumerable. In epithelium (q.v.) are found masses of cells in close juxtaposition to one another, as on the surface of the skin and mucous membranes; in the *connective tissues* (q.v.) the cells are cut off from immediate contact with one another by a development of intercellular substance; in muscle and in nerve the cells undergo remarkable modifications, so that the origin of such structures from cells is far from obvious at a first glance. To Theodor Schwann is due the demonstration of the cellular origin of all animal tissues; he showed that hairs, nails, and other (till his time imperfectly understood) constituents of the body, were composed of altered cells. The "cell theory" which Schwann thus put forward did not merely insist on the fact that the cell was the structural or morphological unit, it hinted at the feasibility of arriving at a just idea of the working of the body, by a study of the properties of cells, in other words it constituted the cell the physiological unit of the animal body. Virchow described the phenomena of disease from this point of view in his cellular pathology; to him is due the famous phrase, "*Omnis cellula e cellula*"—*i.e.* no cell originates save from a pre-existing cell.

From a structural standpoint it is noteworthy that certain modifications have been made in the idea of a cell. To the botanists is due the discovery of the cell, and hence the insistence in early times upon the cell-wall. Animal cells for

the most part have no well-marked outer limiting membrane, and so the nucleus came to assume the first importance. Nowadays it is the protoplasm that commands chief attention in the physiological conception of a cell; and with this change of view comes about an alteration in the attitude of physiology towards the cell theory. It is to a study of the physical and chemical properties of protoplasm, rather than to the particular structural features of individual cells, that the modern science addresses itself. In fact, the modern physiological unit is a limited mass of protoplasm, and not an organised cell. Hence the questions of movement, power of responding to stimuli, and nutrition, will be referred to under Protoplasm; a word may, however, be said here with regard to the reproduction of cells.

Cells may give rise to new cells by budding off a portion of their substance (gemmation as it is called), by free cell-formation, or by division. The last-named method alone occurs in the human body. This division may be direct or indirect. In direct division no complex nuclear change precedes the splitting up of the cell, in indirect division the change does occur, and to it the terms karyokinesis and karyomitosis, have been applied. To understand what is meant by these terms, it must be premised that the nucleus contains a network of fibrils. These fibrils are coloured by a large number of reagents which leave the interfibrillar substance unstained. Hence the name Chromatin is applied to the stain-retaining network, the interstitial substance being called Achromatin. By appropriate treatment of dividing cells it has been shown that cell division is very generally preceded by a complex set of rearrangements of pattern in the nuclear network. To the figures formed by the fibrils, such terms as rosettes, wreaths, spindles, stars, etc., have been applied, and the whole process has been called karyokinesis (*karyon*, a kernel, nucleus, *kinēsis*, motion; or karyomitosis, *mitos*, a fibril). Within the nucleus, rounded bodies, termed nucleoli, can sometimes be seen. Their exact relation to the network is doubtful. Some regard them merely as thickened portions of the fibrils, others as distinct bodies lying free in the interstitial substance. The chemical composition of nuclei has been investigated and a substance called nuclein has been isolated and described.

The "germ plasma," which, according to the theory of Weismann, is transmitted from cell to cell in reproduction, is assumed to be derived from the nucleus. The nucleus doubtless exercises a controlling influence not only over cell-division but also over the nutritive changes which occur in the cell protoplasm.

Cell, Electric. In *Electricity* the cell means each separate element of a battery (q.v.). The following are the more important cells, with their composition and electro-motive force (E.M.F.):—

(A) Simple cells: *Volta*, zinc and copper in dilute sulphuric acid; E.M.F. ·8—1·04 volts, but inconstant. *Smee*, zinc and platinised silver in dilute sulphuric acid; E.M.F. ·7 volts, and polarisation partly remedied. *Bichromate*, zinc and carbon in a solution of bichromate of potash and sulphuric acid; E.M.F. 2·3—1·7 volts.

(B) Compound Cells: *Daniell*, zinc in dilute sulphuric acid, or zinc sulphate, copper in saturated solution of copper sulphate; E.M.F. about 1·1 volts and constant. *Grove*, zinc in sulphuric acid, platinum in strong nitric acid; E.M.F. about 1·9 volts and constant; resistance low. *Bunsen*, similar to the Grove cell, but with carbon stick in place of the platinum. *Leclanché*, zinc in solution of sal-ammoniac, carbon stick imbedded in a mixture of powdered charcoal and black manganese-oxide; E.M.F. about 1·5 volts, diminishing rapidly when in use, but recovering if left to itself; very little attention required. *De la Rue*, zinc in chloride of zinc solution, silver in fused silver chloride; E.M.F. 1·046 volts and quite constant. *Latimer Clark's Standard Cell*, mercury and zinc with mercurous sulphate paste; E.M.F. 1·436 volts.

(C) Secondary Cells: *Grove's Gas Battery*, platinum electrodes in dilute sulphuric acid with hydrogen and oxygen gas evolved at the two poles; E.M.F. 1·47 volts. *Planté*, lead electrodes in dilute sulphuric acid, with surfaces specially prepared by repeated charges in alternate directions; modifications by Faure, Sellon, and others; E.M.F. 2·22—1·96 volts; resistance extremely low.

Cellepora is the type genus of the *Celleporidæ*, one of the families of the Bryozoa, or "moss animals," and belonging to the sub-order Cheilostomata. It is a genus that includes many British species both living and extinct. It forms large thick encrusting or arborescent masses, which in general appearance resemble corals more than do any other members of this group.

Cellini, Benvenuto (1500–1569), a celebrated Florentine engraver, sculptor, goldsmith, author, and madman. The son of a Florentine musician and musical instrument maker, he displayed an early taste for metal-work, and his father apprenticed him to a goldsmith. At an early period of youth his zeal for battle and murder caused him twice to leave Florence and go to Rome, where, on his second visit, a vase that he made, and a medallion, *Leda and the Swan*, brought him to the notice of Pope Clement VII., who made much of him, and when in 1527 the Constable de Bourbon attacked Rome Cellini's love of fighting brought him into great prominence. Among other feats he, according to his own account, killed the Constable and wounded the Prince of Orange. Shortly afterwards he became reconciled to the authorities of his native place and returned to Florence, where he engraved medals, among them being *Hercules and the Nemean Lion*, and *Atlas Supporting the World*. After a visit to Mantua he returned to Florence and again went to Rome, whence, after killing one man and wounding another, he had to flee to Naples. But on the accession of Paul III. he was back in Rome restored to full favour. He had, in the meantime, amused himself by killing another man, and soon, from causes that are not quite clear, he had to leave Rome, to be restored once more, and to be imprisoned, after a visit to the court of

Francis I., upon a charge of stealing jewels from the Pope's crown. He escaped, was recaptured, and was in danger of death, but powerful intercession saved him, and he went again to France and worked for a time for Francis I. Court intrigues led to his retirement from the French court and his return to Florence, where he devoted himself to art under the patronage of Cosmo de Medici. It was during this period that he produced his famous bronze of *Perseus with the Head of Medusa*, a work whose production cost him vast pains, and brought him a corresponding amount of fame and honour. It was in 1558 that he began to compose his memoirs, a book of great value, both as presenting a vivid picture of Italy of the Renaissance, and as being a wonderful piece of self-dissection. His frankness, and his entire absence of shame or reticence, remind the reader of Jean Jacques Rousseau and his *Confessions*, and make his book a delightful study to the student of human nature. The English translation by Roscoe is well worth reading. He wrote also treatises on various points of his art; and produced many other notable works of art, some of which have perished.

Celluloid is formed by well mixing gun-cotton and camphor. The mass becomes plastic and easily moulded when warm, hardening again on cooling. May be coloured by the addition of pigments to the constituents before mixing; and by pressing together differently coloured varieties, it may be obtained of a marbled and mottled appearance. It is largely used as a substitute for horn or ivory, and for the manufacture of imitation tortoise-shell, coral, or malachite articles.

Cellulose. The membrane forming the walls of plant cells, and which generally forms the framework of all vegetable tissues. is, in all cases, composed chiefly of the same chemical substance, termed *cellulose*. Cotton wool, elder pith, hemp, etc., consist almost entirely of cellulose, which may be obtained pure from any of these sources by removing the impurities by different solvents. When so obtained, it is a white solid, insoluble in water or alcohol, but soluble in strong sulphuric acid, which converts it into sugar. If pure it is stable, but in the presence of other vegetable matter it soon decomposes. Its chemical composition may be represented by $(C_6H_{10}O_5)_n$, the exact complexity of the molecule being unknown. By treatment with concentrated sulphuric acid it may be entirely converted into *grape-sugar* ($C_6H_{12}O_6$), a process by which sugar for brewing and other purposes is largely manufactured from linen-rags or other refuse. When acted upon by a mixture of nitric and sulphuric acids, cellulose is converted into nitrates, known as *nitrocelluloses* or *celiulo-nitrins*, of an explosive character, of which *pyroxylin* or *gun-cotton* (cellulotrinitrin), $C_6H_7O_2(NO_3)_3$, is the best known. *Collodion* is a solution of similar nitrates in alcohol and ether. Though cellulose does occur as a rare substance in the animal kingdom, it is more especially characteristic of the vegetable cell, and the cellulose walls can be seen to be formed by nascent or "primordial" cells out of the protoplasmic substance. In the metasperm of the date-palm, and probably in other cases, cellulose occurs as a reserve substance, the cell-walls being thick in the ripe seed and thinning during germination. More commonly the walls of old cells undergo one of three changes, becoming impregnated with lignin, cutin, or mucin, substances richer in carbon than is cellulose. In the first case, *lignification*, characteristic of wood-cells, the wall becomes less plastic, less permeable, hard, and susceptible of a distinct yellow coloration by iodine alone and brown with sulphuric acid. In the second case, *eutieularisation*, characteristic of cork and cuticle, the wall becomes elastic, impermeable, and non-absorbent, and offers great resistance to the action of even strong acids. It becomes yellow on treatment with iodine and does not swell, as do unaltered or lignified walls, on treatment with sulphuric acid. The third case, conversion into mucilage, as in the testa of linseed, renders the walls extremely absorbent, swelling considerably with water. These three changes are known compendiously in German as *verholzung*, *verkorkung*, and *versehleimung* respectively.

Celosia, a genus of *Amarantaeeæ* (q.v.), of which the best-known is *C. cristata*, which is familiar in cultivation in the monstrous form known as a cockscomb, in which the flowering branches are united or *fasciated* into a broad flat mass, covered with the crimson or yellow membranous flowers.

Celsius, ANDERS (1701–1744), a Swedish astronomer, born at Upsala of a somewhat noted family, since his grandfather was a professor of astronomy and a decipherer of Runes, and his uncle professor of theology and author, and the friend and patron of Linnæus. Celsius became professor of astronomy at Upsala in 1730, and in 1736 took part in the scientific expedition of Maupertuis for measuring a degree of the meridian in Lapland. He published an account of the results of this expedition, and wrote many papers upon astronomy and physics, and from 1740 presided over a good observatory, which was erected at Upsala. He is known also as the constructor of the centigrade thermometer, which, as its name implies, is divided between boiling and freezing points into 100 degrees, and is generally accepted for all scientific purposes as the standard thermometer. One of Celsius's theories was that the waters of the ocean are decreasing in volume.

Celsus, a philosopher who is thought to have probably lived somewhere in the latter part of the second century A.D., and who wrote an attack upon Christianity, our sole knowledge of which attack is derived from a criticism upon it by Origen, who was appointed by Ambrosius to examine and refute it. His method of doing this was to quote the passages at length, and examine them in detail, and thus he gives us a more or less clear idea of Celsus's work. Celsus is thought by some to have been identical with a Celsus who was an epicurean and the friend of Lucian, but this seems improbable, since this Celsus speaks contemptuously of Plato and his school, whereas our Celsus was distinctly Platonic in his doctrines.

His attack upon Christianity resembles in many points the criticisms of the present day. In the first part he criticises it from the supernatural point of view, as it might present itself to the few whom he introduces, and into whose mouth he puts his criticisms, and endeavours to show its inherent improbability, if not impossibility. In the second part he criticises it from a philosophical standpoint, and tries to demonstrate that it is unphilosophical, unwise, illogical in the inconsistency of its spiritual and anthropomorphic aspects, and absurd in supposing that God cares more for the few than the many, or more for one part of creation than another.

Celt, a generic term, now obsolescent, for stone implements shaped like chisels and used as cutting instruments. The word is derived from what is generally considered to be a pseudo-ablatival Latin form, *celte*, in the Vulgate (Job xix. 24) translated "with a chisel." No other form of the word is known, so that it is probably a miswriting for *certe* = certainly, verily—corresponding to the "forever" of the Authorised Version. [FLINT IMPLEMENTS, NEOLITHIC, PALÆOLITHIC.] The term has been extended to include implements and weapons of the Bronze Age (q.v.), which were at first copies of, and then improvements on, those of the earlier races, for metal was capable of being worked into shapes which the stone would not admit of.

Celtiberi, an ancient Spanish race sprung from a mixture of Celts and Iberians. They occupied an inland district, south of the sources of the Guadalquivir, and between the Ebro and the sources of the Tagus, Ebro, and Guadiana. They consisted of four tribes, and were famous as cavalry and infantry. They held their own in dress and manners as late as 72 B.C. Their chief towns were Legobriga, Bilbilis, the birthplace of Martial, and Numantia, destroyed by Scipio Africanus in 133 B.C.

Celtic Languages, a main branch of the Aryan family [ARYAN LANGUAGES], which was one of the first to be detached from the parent stem, and which holds a somewhat intermediate position between the Italic and Teutonic branches, but with closer relations to Italic (Latin) than to any other. From the remotest times Celtic is already found split into two well-marked divisions, which differ more from one another than, for instance, the high and low divisions of the Teutonic branch. These divisions, known as the *Gadhaelic* (Gaelic) and *Kymric*, have persisted throughout the historic period, and have left traces of their presence in the geographical nomenclature of the regions traversed by the Celtic tribes during their migrations to their present homes in the extreme west of Europe. The differences are both phonetic and structural, Gaelic, the elder branch, lying in both respects nearer to the primitive Aryan tongue than Kymric. Thus Gaelic preserves the organic guttural *kw* (qu), *k*, which in certain positions becomes *p* or *b* in Kymric. The change, which has been attributed to the influence of non-Aryan languages on the younger branch, is seen in the Kymric *map*, *ap* (Ap John, Ap Thomas), answering to the Gaelic *mac* (son), as in Macdonald, MacConnell, etc. So, also, Gaelic *cen* (pron. *ken*, head), as in Kin-sale, becomes *pen*, *ben* in Kymric, as in the Italian *A-pen-nines*, the Portuguese *Pen-inha*, and the British *Pen-nines*, all meaning *white* (snowy) *head*. These and similar examples, such as Ben-Lomond, Ben-Nevis, Penryn, and the word *pempedula* (quinquefolium, cinque-foil), preserved from the old Gaulish of Central France, show that the Kymric-speaking peoples were more widespread than the Gaels, or else that the latter were displaced by the former, as happened in Wales, Cornwall, and South Britain generally. The reverse process took place in North Britain, where the Picts (Kymric) were gradually displaced by the Scots (Gaels from Ireland). Including the Gaulish, which survives in a few scarcely deciphered inscriptions, the two groups comprise altogether seven members as under:—

GADHÆLIC.	Irish, chiefly in Connaught and West Munster	880,000
	Erse (Gaelic), Scottish Highlands ..	230,000
	Manx, Isle of Man	2,000
KYMRIC.	Gaulish, Central France, extinct ..	—
	Kymraeg (Welsh), Wales and Monmouth	950,000
	Cornish, Cornwall, extinct	—
	Brezonek (Low Breton), West Brittany ..	600,000
	Total of Celtic speech (1890)	2,662,000

Throughout the historic period Celtic speech has been continually yielding to the other members of the Aryan family, and especially to the Italic and Teutonic. Since the second or third century of the new era it has ceased to be heard in Asia Minor, where it had been introduced by the Galatians (Gauls) in 278 B.C. It has long been extinct in Bohemia, Switzerland, North Italy, and (except Brittany) in France, in all of which regions it was current less than 2,000 years ago. In the fifth and sixth centuries it surrendered most of its British domain to the Teutons (Angles, Saxons, Frisians, etc.), and in the tenth century was driven by the Norsemen from Iceland, which island is known to have been first peopled by immigrants from Ireland. It disappeared from Cumberland ("Land of the Kymri") two or three hundred years ago, and died out in Cornwall towards the close of the last century. Since then its territory in Wales has remained somewhat stationary, but in Scotland and Ireland has been greatly contracted. Gadhælic was reduced to writing probably in Pagan times, and written in the so-called *Ogham* character, which in Ireland was replaced with the introduction of Christianity in the 5th century by an alphabet of sixteen letters derived from the Roman. Kymric has always been written in the Roman, and its earliest extant literary monuments, if glosses can be called such, date from the 8th or 9th century. Gadhælic, which possesses a copious literature (poetry, chronicles, legendary history, religious treatises), has almost ceased to be written for the last 200 years, and of all Celtic tongues Kymraeg alone continues to be cultivated (poetry, periodical literature, religious tracts, miscellaneous writings). It will probably survive, a last fragment of primæval Celtic speech, long after the

elder branch has died out. Thanks to the ease with which compound words are formed, both are extremely rich, full of poetic imagery, sonorous and even musical, despite the uncouth appearance of their orthographic systems. This is due to the marked predominance of the vocal and liquid sounds over the consonants, which are themselves uttered more softly or carelessly than in any other Aryan language. Between vowels they tend to become aspirated (mere breathings), and so to disappear, thus giving rise to great contraction and to a highly developed diphthongal series (eleven in Irish besides triphthongs). Hence many subtle laws of euphony, such as the vocal principle of "broad to broad and slender to slender," requiring every consonant or combination of consonants always to stand between two broad (*a o u*) or two slender (*e i*) vowels. Hence, also, initial modifications, especially in verbal inflection, which is further complicated by an elaborate system of primary and secondary tenses, active and passive voices, prefixes, infixes, and postfixes, rendering the verb a formidable obstacle to the student of the Celtic languages. The system is of vast antiquity, for it is common to both branches, and taken in connection with the intricate phonetic laws serves to distinguish Celtic speech in a very marked manner from all other divisions of the Aryan family.

Celts (Lat. *Celtæ*, Gr. *celtai*), a great Aryan-speaking nation of antiquity, who still form a constituent element of the populations throughout South-Central and West Europe and the British Isles; first mentioned by Herodotus, who places them in the extreme west, and "beyond the pillars of Hercules." But Plutarch extends their domain from the Palus Mæotis (Sea of Azov) to the Atlantic, and there can be no doubt that in the course of their migrations, probably from the Russian steppes up the Danube Valley westwards, they made more or less permanent settlements in Bohemia, Helvetia, North Italy (Gallia Cisalpina), and many other intervening lands. But shortly before the new era the bulk of the Celts proper appear to have been already confined mainly to Central Gaul between the Garonne and Seine (Cæsar's Gallia Celtica), and to the British Isles. They were not, however, the first inhabitants of these regions, which had already been occupied by men of the early and later stone ages (pre-glacial and post-glacial epochs), who were partly exterminated, partly absorbed, by the intruding Celts. And thus began that intermingling of races long before the dawn of history, which, combined with the one-sided and often antagonistic theories of anthropologists, philologists, antiquaries, and national prejudice, has tended to involve Celtic ethnology in almost hopeless confusion. The word Celt itself has received as many meanings as the standpoints from which it has been studied, while the secondary or associated terms Galli, Belgæ, Britanni, Picts, Scots, Gadhælians, and Kymrians, are differently interpreted according to the different views or sentiments of British, Irish, and Continental writers. These questions cannot here be discussed; but those who desire to approach their study with unbiassed minds should at least keep in view the first principles of anthropology, as, for instance, that race and language are not convertible terms, consequently that all peoples now or formerly speaking Celtic idioms are not necessarily Celts. From the remotest times the Celtic language was already split into two main divisions. [CELTIC LANGUAGES.] But it would be absurd to conclude from this that the Celtic race was also split into two distinct physical groups. Being admittedly a branch of the primitive Aryan stock [ARYAN RACES], the early Celts could present but one physical type, that common to the other early Aryan peoples, until they became modified by later interminglings with non-Aryan populations. Owing to these interminglings there are now not one but several physical varieties, which seem to have but little reference to the two varieties of Celtic speech. In Ireland alone there are the *dubh* ("black") and the *ruadh* ("red"), both speaking the same Gadhælic form of Celtic. So in France and Belgium we have the small, dark, round-headed Savoyards, Auvergnats, and Bretons, quite different from the tall, fair, long-headed Walloons, some speaking neo-Latin tongues, some the Kymric form of Celtic, but all alike supposed to be "Celts." Here, however, some French anthropologists (Broca and his school) distinguish two types, the Celtic proper (Cæsar's Celtæ) represented by the dark Auvergnats and Bretons, and the Gallic (Cæsar's Belgæ) represented by the fair Walloons. But thus to separate Gauls from Celts is already sufficiently embarrassing, and the same irreconcilable dualism is met in the whole field of Celtic ethnology. Its cause lies in the primitive dual elements (dark and fair) of the Caucasic race itself [CAUCASIC RACE], the explanation being that after separating from the parent Aryan stem, the Celts (originally tall and fair) became more or less assimilated to the dark non-Aryan peoples of Central and West Europe, on whom they imposed their Aryan speech. Hence the primitive Celtic man has been mainly effaced or absorbed in the Ligurian, Silurian, Iberian, and other primitive European populations, and little remains except the primitive Celtic speech.

Cementation Process, a process used for the conversion of wrought iron into steel. The iron is placed in the form of straight bars in the part of the furnace known as the "converting box," and surrounded completely by charcoal, the whole being plastered over. It is then heated strongly for from seven to ten days, until the carbonisation of the iron has proceeded sufficiently. The bars are then reforged. The action seems to be due to carbonic oxide formed, and not to the direct union of the carbon and iron. The process has been known from very early times, but is now, however, completely supplanted by the Bessemer process (q.v.). [IRON.]

Cements, a class of substances used to rigidly connect two bodies by forming a firm layer between, which strongly adheres to both. They may be divided into two classes:—(1) Building cements and

(2) adhesive materials. The second class of cements, adhesive materials, are very numerous, and different in their characters. They may be divided into (*a*) resinous cements, which soften by heat and harden on cooling, as sealing-wax, marine glue, etc.; (*b*) solutions of substances which harden on exposure, owing to the evaporation of the solvent, *e.g.* Canada balsam, caoutchouc dissolved in chloroform, etc.; (*c*) mixtures containing oils, which harden owing to oxidation, putty, white lead; (*d*) substances which soften by the action of water and harden owing to the absorption of the water by the cemented materials, *e.g.* paste, glue, liquid glues, etc.

Until the introduction of Roman cement, only well-burnt stone lime was employed. Thus the mortar in ordinary use is a paste formed by mixing water with one part of slaked lime and three or four parts of sand, the most suitable proportions of these constituents varying with their quality. The purer limes are not so efficient. The hardening is perhaps due to the evaporation or other loss of the water, and to the formation of calcium carbonate by combination of the lime with the carbonic oxide in the air.

Roman Cement is formed by calcining certain mixtures of lime and clay, which occur in the newer geological formations; the burnt material is ground and sifted, and used with about an equal weight of sand. It is generally quick-setting, and is therefore useful in tide-works or other cases where rapid hardening is necessary. Though not very strong, it may form a good hydraulic cement, that is, one which hardens under water, when clay makes up half its weight. All hydraulic cements require at least 10 per cent. of silica.

Portland Cement, named from its resemblance to Portland stone, is a most important manufacture. It is used in many directions, especially with sand or stones, in the construction of docks and harbours. Many failures have occurred in its use, but time is required to show whether these are due to bad manufacture or to unavoidable insufficiency of the Portland. It may be made by wet or dry processes. The former is conducted on the banks of the Thames or Medway in places where chalk and river clay are available. Water is mixed with three parts of chalk and one of clay. This is reduced to a thick, creamy mud by revolving cutters in a wash-mill. It is then allowed to settle, and the superfluous water removed. Then it is dried by heating, calcined, and ground to powder. By the dry process the cement is made from hard limestone and clay. These, in proper proportions, are crushed, burnt, and ground to powder. This is moistened with water, bricks are formed, and a further course of burning and grinding gone through before the cement is available for use. Portland is mixed with a variable quantity of sand, but is stronger without. It forms a good hydraulic cement, but sets slowly. Roughly speaking, it is five times as strong as good Roman cement, both in tension and compression.

Plaster of Paris, *i.e.* gypsum or calcium sulphate, is a convenient cement for forming casts, cementing marble, or fixing metal on glass.

Rust Cement is formed with iron parings and sal-ammoniac. It is useful for joints in ironwork.

Sulphur Cement is made of sulphur, resin, and brick-dust; it is best adapted for earthenware joints.

Sodium-silicate and fireclay or asbestos powder form a heat-proof cement. For other cements *see* White and Red Lead, Shell-lac, Glue, and Isinglass.

Cement Stone, a limestone, earthy and ferruginous, and containing an admixture of clay and often sand. When burnt, so as to convert the carbonate of lime in it into quicklime, this rock yields a hydraulic cement. A tolerable hydraulic limestone contains 10 per cent. of insoluble matter in addition to carbonate of lime; but one with 20 to 30 per cent. is better. The lias is our chief source of cement-stone; but the calciferous sandstone series (q.v.) of Scotland, the septaria (q.v.) from the London and other clays, and the ironstone known as "curl" in Coalbrookdale, are also of importance. More of our hydraulic cements are, however, manufactured by the admixture of ingredients than by calcination of natural limestones.

Cemetery (Greek *koimeterion*, sleeping-place), a burial-ground not around a parochial or other church, or sometimes (loosely) a churchyard. [Burial.]

Cenci, the name of a Roman family made partly famous and partly infamous by the tragic story of Beatrice Cenci, commemorated in the beautiful portrait, said to be the work of Guido Reni. and by the tragedy of *The Cenei*, written by Percy Bysshe Shelley. Francesco Cenci (1527–1598) was one of those characters sometimes produced by high material civilisation, who are gods to themselves, and permit themselves unbounded licence, and who are as free from all moral rule as the old Greek gods themselves. He was rich, brave, and intellectual, and these three qualifications saved him often from the consequences of his perverted sensuality. Among his vagaries was the conception of an intense hatred for the children of his first marriage, and he so persecuted his three sons that they petitioned the Pope to make an end of their father. But Francesco's money saved him. Of his two daughters, the elder petitioned the Pope to let her retire to a convent; and the Pope was so far moved with pity that he provided her with a husband, and forced her father to give her a large dowry. Furious at this, the father shut up Beatrice, who was then 14; and during this confinement he is said to have fallen in love with her, and to have outraged her. But a Cardinal Guerra had also fallen in love with Beatrice, and consulted with Beatrice and her stepmother Lucrezia, and the survivor of the three brothers—Giacomo—how they should dispose of this model father, since a new petition to the Pope had no effect. At last it was arranged that the old villain should receive an opiate, and while he was under the influence of this, Beatrice introduced two assassins into his room, who drove a couple of nails, one through the sleeper's eye into the brain, and the other through the throat. The daughter

and stepmother withdrew the nails, and dragged the body to a gallery, and threw it into the branches of a tree, so that it should appear that the old man had accidentally fallen from the gallery. It was some time before suspicion was aroused, and the clues followed up which revealed the deed and the doers. The Pope had found it easy to deal gently with the criminal father, but felt compelled to resist all prayers for pardon for the two maddened women. Beatrice and her stepmother were beheaded, Giacomo was killed with a club, and Bernardo, the youngest brother, was put into a monastery.

Cenotaph (Greek *cenos*, empty, and *taphos*, a tomb), a monument erected to a person buried elsewhere.

Censer, a vessel for burning incense used in ancient times by Pagans, and by the Hebrews in the service of the Temple, and in the Christian Church. The present form of censer used in churches is a kind of vase suspended by chains for convenience of swinging, and so diffusing the fragrance of the incense, which is scattered upon live charcoal in the vase, and covered by a perforated lid to prevent the burning substances from falling out.

Censors, two officers of the Roman state whose duty it was in the first place to check and regulate the census or list of citizens, a duty which, as it involved the removal from the list of unworthy citizens, caused them to become in time the dreaded arbiters of morals and manners. They were elected by the *Comitia Centuriata*, originally for five years (called a *lustrum*) and afterwards for eighteen months. They were the highest officers of the state except the Dictator, and had vast equitable powers. They had also charge of the public revenues and of public works. Till 351 B.C. they were always patricians, in 339 B.C. it was enacted that one of them should be a plebeian, and in 131, for the first time, both were plebeians. The magistracy was abolished by Sulla, and though restored shortly afterwards never recovered its position. We last hear of it under Augustus in B.C. 32. After this its powers were absorbed by the emperor.

Census (Latin *census;* cf. *censeo*, I estimate), in ancient Rome a registration of the heads of families with their landed property, intended to serve as a basis for taxation and the assignment of various degrees of political power. The first census was that of Servius Tullius. The list was revised at stated periods by the CENSORS (q.v.). Under the later Roman Republic and the Empire the census was a record of the population of a province with their landed or other property, intended to furnish data for fixing the tribute to be paid by the province (cf. Luke ii. 1–3).

Between the fall of the Roman empire and the end of the last century there was no general enumeration of the people of any European country. The desirability of it, from the economic point of view, was hardly seen, and had it been seen, religious scruples, due to the punishment of David for numbering Israel (2 Sam. xxiv.), would doubtless have interfered. There were, however, occasional partial enumerations of the populations of certain districts under the despotic governments of the Continent. The first census, in the modern sense, in Great Britain, was taken in 1801, and it has been repeated ever since at intervals of ten years. The first census of Ireland was taken in 1811, but was very inaccurate, as was also that of 1821. The establishment of a uniform registration of births, deaths, and marriages, in Great Britain in 1837, and the creation of the Royal Irish constabulary, provided better means of correct enumeration. Information on agriculture was first collected in Ireland in 1841. A religious census is taken in Ireland, and was carried out in Great Britain in 1857, but the objections of the Nonconformists, based on the fear that almost all persons whose creed was doubtful would be ranked as members of the National Church, have prevented its repetition in Great Britain. At every census additional particulars have been taken. At the 1891 census of the United Kingdom a return was required from residents in Wales and Scotland, of the language habitually spoken by them; and with a view to estimate the degree of overcrowding among the working classes a return was also taken of the number of rooms occupied by families occupying less than five. In 1891 also, in the return of occupations, a distinction was made, for the first time, between employers, employed, and persons working on their own account.

The first census of the British Empire was taken in 1871, when the population was found to be 234,762,593.

In the United States a census has been taken every ten years from 1790, and an intermediate census is taken every five years. The particulars noted are very minute and various, and relate to agriculture, mining, and various branches of industry, as well as to the population. Some offence was caused at the 1890 census by a query addressed to the landowners as to the mortgages (if any) on their property. There is reason to believe, unfortunately, in some of the more backward states the enumeration has at times been very defective, and the appearance of a large increase in the negro population between 1870 and 1880 is now attributed to the defective enumeration of the former year.

On the Continent of Europe censuses are usually taken at intervals of ten years. The last census of France was taken in 1891, that of Germany in December, 1890.

Cent, in the United States and Canada, the 100th part of a dollar (q.v.), about equal in value to $\frac{1}{2}$d. sterling. The Dutch florin, value about 1s. 8d., is also divided into 100 cents. The *centime* of France, and the *centesimo* of Italy, are each the 100th part of a franc. The word cent. is also used as an abbreviation of the Latin *centum*, 100, as in the phrase "the Three per Cents."

a **Centauri,** a brilliant star in the southern celestial hemisphere, invisible in these latitudes. It is second in brightness to Sirius. Its parallax was first determined at the Cape of Good Hope by Henderson, and its distance from us found to be approximately thirty billion miles.

Centaurs, historically, were probably a mounted race of hunters in Thessaly—a kind of Gaucho of olden times. Homer mentions them as "gigantic, savage, and covered with hair," and by Pindar's time they had reached the mythological stage, and were become half man and half horse. Centaurus, their father, was represented as the son of Ixion and the cloud, and their mothers were mares. They are spoken of as having fought with the Lapithæ at the marriage of Peirithous with Hippodamia, and with Hercules. The most noted of them was Chiron, who was the instructor of Achilles.

CENTAUR.

Centenary (Latin, *centeni*, the distributive adjective from *centum*, a hundred), the celebration of the hundredth anniversary of any event. Such celebrations have been common of late years. Thus the centenary of the United States Declaration of Independence was celebrated in 1876, and the tercentenary of Shakespeare's birth in 1864.

Centering, the frame or mould used in the construction of arches, vaults, groins, cupolas, etc., for the support of the stone, brick, or iron during the course of their formation. The design for the centering of bridge-arches is of great importance. [BRIDGES.] If the passage through the arch is not required during its building, temporary piers may be built to support the centering, considerably facilitating its simple construction. But frequently piers are undesirable, and it becomes necessary to leave head-room above the springing of the arches. Then the design is difficult, especially for long spans. The beams must be arranged, so that the stresses in them are for the most part compressive. The structure must be able to support the incomplete arch, and must neutralise the tendency for the deadweight at the haunches to force the crown upwards. On the completion of the arch the centres are *struck*, or lowered a little by the removal of certain key-plates. It may then be seen whether the arch is sufficiently strong to hold itself; the sinking at the crown should not exceed 3 or 4 inches. Brick arches should not be struck till the mortar is well hardened.

Centigrade, a method of expressing temperature, introduced by Celsius about 150 years ago. The range of temperature, from that of the freezing point of water to its boiling point under standard pressure, is divided into 100 parts or *degrees*. Freezing-point is called 0°, and boiling-point 100° Centigrade, and intermediate temperatures are represented by numbers between 0 and 100. Temperatures below the freezing-point of water are negative; thus the freezing-point of mercury is expressed −40° C. The Fahrenheit scale (q.v.) is more generally used in England, except among scientists; the Centigrade scale is used all over France, and the Réaumur (q.v.) in Germany. [TEMPERATURE, HEAT.]

Centimetre, a unit of length, the hundredth part of a *mètre* (q.v.). Its value in English measure is ·3937079 of an inch, which is between $\frac{3}{8}$ths and $\frac{2}{5}$ths of an inch; either of these fractions may be taken as an approximation. A cubic centimetre of pure water at 4° C. has a mass of one gramme, or very nearly so. A litre of pure water, or 1000 cc., weighs, therefore, one kilogramme. [METRIC SYSTEM.]

Centipede is the popular name for one of the animals belonging to the Chilopoda, one of the orders of the Myriapoda. They are all land animals, generally of small size, with an elongated body, somewhat flattened from above downwards, composed of a series of similar segments, and with one pair of legs to each segment. They breathe by tracheæ or tubes ramifying through the body. They have a powerful pair of poisoned claws. As Myriapods they belong to the great phylum Arthropoda (*i.e.* having jointed limbs), and among the members of this group agree most closely with the Insects. The Centipedes especially support this alliance by the remarkable genus *Scolopendrella*, which is by some authors placed among the Insects in the class Thysanura. It may be roughly described as an insect with many similar segments, having limbs on the abdomen. The British centipedes are harmless, and generally small, rarely more than two inches in length. *Lithobius forcipatus* is the commonest British species. The Centipedes differ from the Millepedes, which form the second important order of the Myriapods, in that the antennæ have more than fourteen, and rarely more than forty, joints, and that they have one pair of limbs to each segment, instead of two as in the Millepedes. The Centipedes also have a large "basilar" segment behind the head composed of several fused segments. The earliest Centipedes have been found in the Carboniferous period.

Centlivre, SUSANNAH (1667–1723), a dramatic writer, born in Ireland, the daughter of a Lincolnshire gentleman named Freeman, who had been a Parliamentarian and so was obliged to quit England at the Restoration. His orphan daughter came to England and married at 17. Her husband dying in about a year, she married an officer who was killed in a duel before they had been married two years. His widow then took to acting and play-writing with much success, and her wit and attractions brought her to the notice and friendship of Farquhar, Rowe, Steele, and other distinguished men. In 1706 she married Queen Anne's head cook, a Mr. Joseph Centlivre. Among her best known works are *The Busybody* and *A Bold Stroke for a Wife*.

Cento (Lat. *cento*, *centonis*, a patchwork; apparently from Gk. *kentron*, in the sense of a *pin*), a composition consisting of lines taken from various

places in the works of one or more authors, so arranged as to make a poem with a continuous sense. Such "centos," especially from Virgil, were a common exercise of ingenuity in the later periods of Latin literature. The term is also applied to sets of musical selections.

Central America. [AMERICA.]

Central Attraction. When a body is moving under the action of a force which is continually directed towards a fixed point it is said to be subjected to a central attraction. If this is the only force acting on it, the path described by the moving body is said to be a *central orbit*. Approximate examples occur in astronomy; the earth describes a central orbit round the sun, towards which it is continually being attracted by force of gravity. In a case like this the body moves in such a way that the line joining it to the centre of attraction sweeps out equal areas in equal times. This applied to planetary motion is one of Kepler's laws, determined by observation.

Central Criminal Court. A court for the trial of treasons, murders, felonies, and misdemeanours, committed within the City of London, and county of Middlesex, and certain parts of Essex, Kent, and Surrey, and on the high seas. It was constituted by an Act of Parliament passed in the year 1834, and its sessions are held at least twelve times in every year.

Centralisation, the transfer of administration from local authorities to some department of the central government of a state. As a rule, the tendency to this transfer has increased with civilisation; and an analogy to it has been found in the increasing dependence of the whole body upon the brain, the higher we look in the scale of animal existence. In the earliest type of large states, the "tax-taking empires," such as the Assyrian and Persian empires of antiquity, the rulers demand contributions of men and money from their subjects, but hardly interfere at all in their local affairs. The dominion of ancient Rome, until the second century of the Christian era, was, in theory, a group of peoples, mostly either organised in city-communities or destined to be so organised when they should be sufficiently civilised under the presidency of the Imperial city, Rome. Their liberties were very various, and in most cases subject to interference from the Roman government. But, in theory though not in practice, this interference was occasional and temporary. The rise of a trained Imperial bureaucracy (q.v.) and the frequent incapacity of the local authorities, especially in finance, gradually tended to throw the supervision of all details of local administration into the hands of the Imperial authorities at Rome. The great monarchies of modern Continental Europe, having arisen on the ruins of the feudal system and by the absorption of many separate states, have tended of necessity to substitute central for local control of administration. The tendency has been aided by the improvement of means of communication, and in past times by the theory (best seen in Russia to-day and in the France of Louis XIV.) that all power centres in the monarch, and it is his duty as God's vicegerent to see that all goes right among his subjects. The writers of the French revolutionary school, again, were mostly desirous of a strong central government to crush the apparently irrational anomalies existing in different parties of France. All over the Continent, therefore, administration is very greatly centralised, though a reaction is of late years perceptible in France, and the Federal structure of Switzerland partly prevents the tendency from being fully realised. In England there has never been the practical necessity for unifying the nation, which has been felt in Continental countries, nor has a despotic Government arisen analogous to theirs. Still there has been tendency to control local bodies by Government departments, the creation of the Poor Law Board in 1834, of the Local Government Board, of the Committee of Council on Education, and, more recently, the transfer of local prisons to the Home Office being conspicuous instances. But of late years a counter-tendency has arisen. The concession of representative government with almost complete independence to Canada and the Australian Colonies, the movement for Home Rule in Ireland, the establishment of County Councils, and the demand for district councils are examples of this latter.

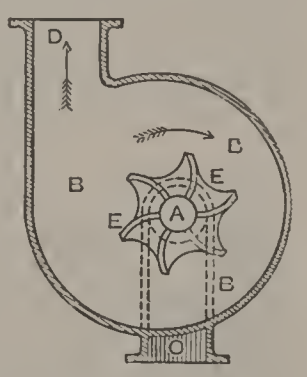
Central Provinces, a part of India administered by a Chief Commissioner, and lying between lat. 17° 50′ and 24° 30′ N. and between long. 76° and 85° E., with an area of over 100,000 square miles, and containing eighteen British districts and fifteen native states. The territory consists of a series of alternating table-lands and plains intersected by rivers, and in the south is a rugged hill and forest land—the wildest part of the peninsula. The chief commissionership consists of four divisions—Nagpur, Jabalpur, Nerbudda, and Chatisghar. In the N. the Nerbudda separates the Vindhyan and Satpura table-lands; then comes the Nagpur Plain, having the Chatisghar Plain to the E., and beyond that a wild forest-land extends almost to the Godavery. Owing to the rugged formation of the country, and the rapid slopes, the Nerbudda and other rivers have all the character of mountain torrents. The great feature of the Central Provinces is the great and rapidly recurring variety of the soil and vegetation. The Nerbudda Valley is occupied by beautiful corn-lands, and the wilder uplands are studded with spots of high fertility, where sugar-cane and opium are largely cultivated. The Nagpur Valley produces rice, and cotton and tobacco are also cultivated. Coal and iron are also found, but the coal is not of good quality. The population is chiefly rural, but there is some weaving and smelting and working of iron. The inhabitants are chiefly Hindoo, but there are some of the original inhabitants who retreated before the Hindoo conquerors into the upland fastnesses, and have preserved their own religion, which has in its turn greatly modified that of their immediate Hindoo neighbours, who have adopted some of their beliefs and practices. The Great Indian Peninsular Railway and the East Indian Railway intersect the country, and a new line has been constructed to

open up and develop the coal-fields—a proceeding which will add to the prosperity of the district.

Centre, a term in general use in mathematics and dynamics, denoting a point possessing certain special properties. The centre of a circle is defined by Euclid as the point such that all lines drawn from it to the circumference of the circle are of equal length. More generally the centre of any conic section, whether circle, ellipse, parabola, hyperbola, or line-pair [CONICS] denotes that point which bisects all lines drawn through it and terminated by the curve. Similarly in solid geometry, since every section of any quadric surface (q.v.) is a conic, the centre of any such surface shall bisect all lines passing through it that are terminated by that surface. *Centre of figure* is also purely geometrical. The centre of figure of any aggregation of points is that point occupying the average position of all the given points. That is to say, its distance from any plane is the average distance of all the points in the figure from that plane. This applies to lines, areas, or solids, regarding any one of these entities as an aggregation of points. *Centre of mass*, or *mass-centre* of any number of masses, may be regarded as the centre of figure of a system of equal material points which give the same resultant mass-distribution as is presented by the given masses. Such a point always exists, and from its definition it is still geometrical. *Centre of gravity* of any system of material particles is a dynamical conception. It is the point through which passes the resultant pull of the earth's gravitation for all the particles. If the forces on all the particles were strictly parallel, a centre of gravity would always exist for a body of any shape, and would coincide with its mass-centre. But these forces are not strictly parallel, and as a consequence true centres of gravity only exist for special distributions of matter, such distributions being known as *centrobaric*. It is evident that the term *centre of gravity* should only be applied to mass distributions. The *centre of suspension* of a pendulum is that point by which it is hanging. If at rest, the centre of gravity will be vertically beneath. This line joining the centres is called the *axis* of the pendulum, and the *centre of oscillation* is that point in the axis where a mass might be concentrated so that if suspended by a weightless thread from the same point of support, it would swing in unison with the given pendulum. If the pendulum be rigid, and be struck horizontally at its centre of oscillation, no tendency to displace the centre of suspension will be observed. This is not the case for any other point of application of the blow. Hence the term *centre of percussion* is applied to the centre of oscillation of any rigid body. In hydrodynamics the term *centre of pressure* denotes the point of application of the resultant fluid pressure on any plane area. *Centre of buoyancy* of a floating body denotes the mass-centre of the displaced liquid, and is practically the point through which passes the resultant upward pressure of the surrounding liquid.

Centrifugal Force, a term used in dynamics. A moving force tends to continue its motion in the same straight line. If compelled to move in a curve, it exerts a force against the restraint called *centrifugal force*. This is at any instant in the direction of the centre of curvature for that instant; it is proportional to the mass of the body and to the square of its velocity, and is inversely proportional to its distance from the centre of curvature. If a weight is whirled round in a circle by means of a string, centrifugal force tends to break the string. The force that the string itself exerts on the body is termed *centripetal*. The rotation of the earth, when more plastic than it is at present, probably was the cause of its oblateness. The outer rail on a railway curve is placed at a higher level than the inner, so that the resultant pressure due to the weight of the train and to centrifugal force shall be approximately perpendicular to the plane of the rails. If a quantity of liquid be rotated in a convenient vessel, any solid particles or other heavier matter contained in the liquid will, by action of centrifugal force, fly outwards to the sides of the vessel. This principle is used in certain processes of clarification.

Centrifugal Pump, in *Hydraulics*, is an arrangement for lifting water by means of a rapidly rotating water-wheel of special shape. Water passes from a large supply-pipe C, into the central part of the wheel A, the vanes of which are so shaped that they take up the water without jerk and whirl it round till it reaches the outside. Emerging here it has both tangential and radial motion, and is made to circulate in the outer or *discharge-chamber* B, gradually losing in velocity but gaining in pressure, and therefore able to force a discharge up the pipe D to a certain height corresponding to the pressure in the pump. Thus, theoretically speaking, the pump gives first kinetic energy to the water; then in part converts this energy of motion into pressure-energy, and finally into the potential energy due to a higher level. All the parts of the pump must be designed so as to avoid sudden changes in the direction of the flow of the water. Centrifugal pumps work best at the particular lift for which they are designed. If used to pump water to any other height their efficiency is less, and rarely exceeds 50 per cent. A pump of the ordinary Appold type, about 16 inches in diameter, working at 700 revolutions per minute, would deliver about 1,500 gallons of water per minute with a lift of 25 feet.



CENRIFUGAL PUMP.

Centrolecithal eggs or ova are those in which the yolk occupies the centre, *e.g.* in the crab. This type of egg is, in fact, limited to the Arthropoda.

Centumviri, a civil court at Rome, the functions of which, however, are extremely obscure. According to one authority, it was composed of three jurors from each of the 35 tribes.

Centurion, in the Roman army, originally the commander of a *centuria*, or company of foot-soldiers, nominally of 100 men. In the second Punic war, however, there were two such companies to the *manipulus*, or body of 120 men, and there were afterwards always 60 centuries and centurions to the legion. The centurions were chosen by the commanders of the legion. They seem to have varied considerably in rank, and the senior centurion of the legion (*centurio primi pili*) was an important personage, and admitted to the field officers' council of war. Each centurion had a lieutenant (*optio*) under him selected by himself. They seem to have been rarely promoted to higher posts, and usually rose from the ranks. As charged with the discipline of their company, their badge of office was a vine-staff, with which they inflicted floggings.

Ceos, now ZEA or TZIA, an island of the Ægean, lying 14 miles from the coast of Attica, and forming one of the group of the Cyclades. It is about 13 miles long and 8 broad, and rises gradually toward the central point, Mount Elias, 1,860 ft. in height. The chief products of the island are citrons, lemons, olives, wine, and honey. Of the four towns which the island anciently possessed the only one now of importance is Zea, the capital, whose population forms more than half of the whole population of the islands. The Cean laws were of old proverbial for their excellence.

Cephaëlis. [IPECACUANHA.]

Cephalaspis, a genus of fossil fishes occurring, among the earliest of the class, in Upper Silurian and Old Red Sandstone deposits. It is the type of the family *Cephalaspidæ* of the sub-order *Placodermata* of the ganoids. It has a persistent notochord, but ossified peripheral elements of the vertebræ, a heterocercal tail, a dorsal fin, rhomboid scales, and a head-shield with distinct bone-cells. It is named from its cephalic shield, with its posterior angles produced into long "cornua."

Cephalobranchiata, the group of worms in which the branchiæ or gills are borne on or around the head; they are usually fixed forms, living in tubes made of calcareous matter, or of particles of sand, mud, shells, etc., cemented together.

Cephalonia, anciently SAME and CEPHALLENIA, one of the Ionian islands, opposite the Gulf of Corinth. It is 30 miles long, and of a breadth varying from 20 miles in the south to about 3 in the part which lies parallel to Ithaca, from which it is separated by a strait of 4 miles across. The island is mountainous, and Monte Negro—so called from the pine forests which clothe it—has a height of 5,300 feet. The productions are currants and olive oil. The grape-vine has of late been largely cultivated, and there is a growing wine trade. Some cotton is also produced upon the low-lying grounds.

Cephalophora (*i.e.* head-bearing), the subdivision of the phylum Mollusca that includes all those classes which have heads, viz. the CEPHALOPODA, PTEROPODA, GASTROPODA, and SCAPHOPODA. It is used in contradistinction to the ACEPHALA.

Cephalopoda (or *head-footed*), a class of Mollusca in which the foot is produced into three pairs of lobes; one pair of these meet in front of the mouth, and thus the head appears to be surrounded by the feet. The main characters of the class which distinguish it from other head-bearing Mollusca are these:—The body is bilaterally symmetrical; the lobes of the feet bear either tentacles or suckers, many in number; there is a powerful muscular fold on the ventral side of the visceral sac, which serves both for respiration and locomotion; the possession of an elongated visceral mass; a highly developed blood-vascular system, with a pair of auricles and branchial hearts; and a series of pigment spots in the skin, which the animal is able to contract or expand, and so change its colour into a resemblance to that of surrounding medium. Of these points the most important are those relating to the development of the foot, which is composed of three regions, each formed by the union of a pair of lateral lobes. The three regions are the propodium, mesopodium, and metapodium. Of these the first is the anterior; it is formed by the two lobes growing round in front of the head; the margin of the propodium is continued out into a series of eight or ten arms provided with suckers (Octopus, Squid, etc.), or of the same number of lobes bearing numerous tentacles (Nautilus). The mesopodium is a flat fold of muscle on the ventral side; it forms a chamber opening to the exterior by a pair of flaps (Nautilus), which have fused into a funnel in the Cuttle Fish, Squid, etc. The hind foot, or metapodium, forms a small valve by which the siphon may be closed. The use of the chamber is partly respiratory and partly locomotor. The chamber may be filled with water, which, on the contraction of the muscular fold, is driven out of the narrow aperture and thus the animal is propelled backwards.

The shell of the Cephalopoda is very characteristic, and very variable in form and importance. In the two orders of the Nautilus and its allies (NAUTILOIDEA) and the Ammonites and their allies (AMMONOIDEA), the shell was external; it was a hollow cone, straight, curved or coiled, divided into a series of chambers by transverse septa; the whole of the chambers were connected by a membranous tube (siphuncle), which was on the outer curve of the shell in the Ammonites, but central or internal in the Nautili. In the Ammonoidea the margins of the septa (suture lines) are usually very sinuous, while in the Nautiloidea they are simply curved. The structure of the young shell is, moreover, very different in these two orders; in the Ammonoidea the embryonic shell (protoconch) is preserved; in the Nautiloidea it is lost, and its place is marked by a scar. In the third order the shell has become enclosed by the mantle; it is coiled and chambered as in *Spirula*, or conical and chambered as in *Belemnites* and *Sepia*. A chitinous sheath, deposited by the enveloping mantle, forms the "guard" of *Belemnites*, the "mucro" and

shagreen layer of *Sepia*. In some forms, *e.g.* the Squid, this sheath is all that remains of the shell, and is called the "gladius" or "pen." In Octopods even this also is lost.

The respiratory organs consist of one or two pairs of gills or ctenidia, placed in the branchial chamber; they are aerated by water taken into this chamber and forced out through the siphon. The excretory organs (nephridia) lie at the base of the gills, and are, like them, in one or two pairs. Among special organs in the Cephalopoda may be mentioned the ink sac of the order with enclosed shell. This is a bag close to the stomach, with a duct passing out by the anus to the funnel. The sac is filled with sepia, some of which is discharged when the animal wishes to conceal itself. As the shell of the "Squid" consists of a long narrow quill-like plate, the animal has consequently acquired the name of the "pen-and-ink fish."

The Cephalopoda were formerly classified as Tetrabranchiata and Dibranchiata. The former included the more primitive forms with four gills, four nephridia, a primitive "penhole" eye, an external chambered shell, traversed by a membranous tube, the "siphuncle"; they were represented by only one living genus, *Nautilus*. Modern writers separate the forms with external shell into the two orders *Nautiloidea* and *Ammonoidea*. As to the internal organs of the latter order very little is known. The third order with enclosed shell practically corresponds to the old group Dibranchiata. The members of this order have but two gills and nephridia, large and specialised eyes, a funnel, ink-bag, and arms bearing suckers. They are divided into the sub-orders (i) DECAPODA, with ten arms and pedunculate suckers, as in the Squid; (ii) OCTOPODA, with eight arms and sessile suckers, as the Argonaut and Devil-fish.

The oldest Cephalopod comes from the Tremadoc rocks in the Cambrian system.

Cephaloptera. [DEVIL-FISH.]

Cephalotrocha, one of the types of worm larvæ. It has a single band of cilia around the anterior end of the body, and is hence also known as "Monotrocha."

Cephalotus, the Australian pitcher-plant, a native of King George's Sound, having a rosette of radical leaves, many of which are converted into pitchers, much like those of *Nepenthes* (q.v.) and doubtless serving an insectivorous function. The flowers are on a long spike, have a six-leaved calyx, no corolla, twelve stamens on a disc, and six distinct one-seeded carpels. It is the one species of a genus now classed as an aberrant type of the *Saxifragaceæ*.

Cepola. [BAND-FISH.]

Ceram, or SERANG, one of the Southern Moluccas belonging to the Dutch residency of Amboyna. An isthmus divides the island into two parts, and a mountain chain traverses the country, rising to a height of 11,000 feet. Not much is known of the interior, and the inhabitants are gathered chiefly in the coast villages. The sago palm is the chief object of cultivation and attention; but there are also cocoa plantations; iron-wood, and other timber is exported; and maize, sugar-cane, and a variety of fruits are to be found. Among the birds are the swallows that build edible nests.

Ceramics. [POTTERY.]

Cerastes, a genus or sub-genus of the viper family, confined to Africa, and distinguished chiefly by the development of the scales above the eyes into horn-like processes, whence the popular name, horned vipers. Their scientific designation is the ancient Greek name for a species found in the northern parts of the continent. These reptiles are very venomous.

Cerate, a mixture of waxy and oily substances, in proportions which give a mass of buttery consistency. Ordinary cerate is made by melting together wax, olive oil, and spermaceti. A mixture of resin cerate and vaseline is useful in chemical manipulations as a lubricant for glass stoppers, etc.

Ceratodus, a genus of Dipnoi, with two species, from the fresh waters of Queensland. [MUD-FISH.] The name was originally given to a genus of fish founded on fossil teeth, of Triassic and Jurassic age from Europe, India, and America—their chief British locality being Aust, near Bristol. The living genus, discovered in 1870, received the same name owing to similarity of dentition.

Ceratonia. [CAROB.]

Cerberus, in Greek mythology, the three-headed dog who guarded the entrance of Hell, not so much to keep people from going in as to keep them from getting out when once they got there. His duty was not always successfully performed, since Orpheus charmed him by his music, and Hercules dragged him neck and crop to the upper world. Hesiod represents Cerberus as having many heads, but three is the more orthodox number. Some derive the name from Erebus, or darkness.

Cercaria. [LIVER FLUKES.]

Cercis. [JUDAS-TREE.]

Cercopithecus, a genus of monkeys, with about twenty species, from tropical Africa. They belong to the Cynomorpha, or dog-shaped monkeys, but are graceful and amusing, and the fur of many of them is finely marked.

Cercopoda are the short style-like processes of which there are a pair at the hinder end of some insects, such as cockroaches, grasshoppers, etc. They are regarded as the rudiments of a pair of limbs, and are thus of interest, as they are the only legs in insects which are not on the thorax or middle division of the body. They apparently suggest that the ancestral form of the insects had a pair of legs to each segment of the body.

Cere. [BILL.]

Cereals, grains used for food mostly as bread-stuffs, or ground into flour or meal. They are mostly grasses, the chief being wheat, barley, oats, rye, and the millets. With them may be classed buckwheat, which is not a grass, and maize and

rice, which are largely eaten in an unground condition. The cereal grains, so called from the Roman goddess Ceres, form the staple food of more than four-fifths of the human race. [GRASSES, WHEAT, BARLEY, etc.]

Cerebration, UNCONSCIOUS. This term has been applied to cases of the following kind:—A person, after making unavailing attempts to remember something, puts the question aside, and then suddenly, when he is occupied with an entirely different class of thoughts, the fact he has been striving to recollect flashes across his mind. To call such a phenomenon unconscious cerebration implies a belief in a theory, viz. that the elaboration of reasoning processes in the brain can go on unconsciously. This may be the case, but most instances of so-called unconscious cerebration admit of other and simpler explanations.

Cerebrin, a tasteless and odourless white powder, which can be extracted from brain substance, and which also enters into the composition of nerves, pus-corpuscles, and yolk of egg.

Cerebro-spinal Fluid. This fluid is contained in the ventricles of the brain and in the central canal of the spinal cord; it is also found forming a kind of water cushion which envelops the delicate nervous structures, and occupying the subarachnoid and subdural cavities. The importance of the layer of fluid in protecting the brain and cord from injury, and the manner in which the amount of fluid is adapted to the capacity of the cranial cavity [BRAIN] have been already alluded to. Cerebro-spinal fluid contains but little solid matter. Its specific gravity rarely exceeds 1010; a little proteid is present in it, and there is usually a trace of a substance which reduces copper salts. Cerebro-spinal fluid sometimes escapes from the ear in cases of fracture of the base of the skull.

Cereopsis, a genus of geese, with a single species (*C. novæ-hollandiæ*), from Australia and the adjacent islands, owing generic distinction chiefly to the broad cere which nearly covers the bill. The flight is laboured, and the flesh is excellent in flavour—two important factors in the increasing rarity of these birds. Their nearest ally, the extinct New Zealand goose (*Cnemiornis*) was probably incapable of flight.

Ceres, the Roman goddess of seedtime and harvest, afterwards amalgamated with the Greek goddess Demeter, and credited with all the virtues and properties of the latter goddess. The story of Demeter's loss of her daughter, who was abducted by Pluto as she was picking flowers in the meadows of Enna in Sicily, and how the sorrowing mother sought Persephone over the earth till Zeus in pity allowed mother and child to live together on the earth for half the year, has been prettily told by the poets, and the coming back of Persephone to her mother forms the subject of many paintings.

Cereus, a large genus of *Cactaceæ*, having numerous stamens united at the base and nearly as long as the petals, and a slender style but little longer. Among the best-known species are *C. giganteus*, of the deserts of New Mexico, and *C. grandiflorus*, of the West Indies. The former grows fifty or sixty feet in height, with an erect cylindric fluted stem, unbranched, or with branches turning upwards parallel with the main stem. The spines rise in tufts on cushions along the ribs or flutings. *C. grandiflorus*, and other species with pale flowers, blossom at night, giving off a vanilla-like perfume intermittently.

Cerignola, a town of Italy, in the Neapolitan province of Capitanata, 23 miles S.E. of Foggia, on a height commanding a fertile plain that produces almonds and cotton. Gonsalvo de Cordova's victory over the French at this spot, in 1503, established the Spanish supremacy in Naples. Linen manufactures are carried on.

Cerigo, anciently and now again known as Cythera, the most southerly of the Ionian islands, separated by a strait from the Morea. The island is rocky and broken, but some spots are fertile. The greater part is pasture land, and the goat-cheeses of the island are noted. It produces also good olive oil. There are beautiful stalactite caves in the island, one being near Capsali, which is the capital. Although Cythera was the home of Aphrodite (Venus), no traces of her shrine are to be found.

Cerinthus, an early Christian heretic (98–117). Irenæus, who is the chief authority on his doctrines, states that he maintained that the world was not created by God, but by some separate and distinct power that knew not God. He held also that Christ was of simply human birth, but received the Divine nature at His baptism, when the dove descended, and that this Divine nature quitted Him before the crucifixion, since the Divine nature could not suffer. But not much is really known either of Cerinthus or his views. He appears to have had Judaising tendencies, and is said to have been among those who condemned St. Paul's going to Cornelius. There is a story that St. John fled from a bath in which Cerinthus was lest the walls should fall in.

Cerite, a rare mineral, occurring chiefly in Sweden; it consists chiefly of a hydrated silicate of cerium, and, in smaller quantities, of lanthanum and didymium. These three metals were originally discovered in this mineral.

Cerium (Ce. at. wt. 140, sp. gr. 6·72), a rare malleable and lustrous metal, occurring with others in cerite and a few other minerals. It burns in air with great brilliancy, and forms two oxides, Ce_2O_3 and CeO_2, and yields series of salts corresponding to both these.

Cerium Oxalate. This drug is contained in the British pharmacopœia. It is administered in cases of vomiting and dyspepsia, and is said to be especially valuable in the vomiting of pregnancy. The dose is 1 to 2 grains.

Certhiidæ, a small family of Passerine birds, widely distributed, but absent from the Neotropical and Ethiopian regions. They are climbing or scansorial in habits, having three toes in

front and one behind. They feed principally on insects. [CREEPER.]

Certificate, a formal document written by some official and containing his statement as to some matter within his official knowledge. Such documents are of many kinds, the best known perhaps being the certificates of birth, marriage, and naturalisation, that of death, signed by the medical attendant, and the certificate or order of discharge in bankruptcy (q.v.).

Certiorari, a writ issuing from a superior to an inferior court, directing the transmission of the records or other proceedings to such superior court, the object being that the judgment of the inferior court may be reviewed, or that the decision and the proceedings leading up to it may take place before the higher tribunal. It is usually applied for before the trial. It lies either for the verification of errors, or for the removal of plaints in replevin, or (more generally) for the removal of criminal cases, in which case the writ may be granted either at the instance of the prosecutor or the defendant. A prosecutor was formerly entitled to it as a matter of right, but a defendant could only obtain it by express leave of the court, and upon his entering into recognisances; but to prevent abuses, by the wanton and improvident resort to this proceeding, certain statutes, passed in the last and the present reign, provide that a prosecutor must obtain the previous leave of the court to issue it, and enter into recognisances, and these and other statutory provisions are incorporated in the Crown Office Rules, 28–42. The practice now largely depends on these rules.

In order to avoid frivolous appeals there is often a restriction or abrogation of the right to a certiorari in the statutes conferring summary jurisdiction on inferior tribunals. A certiorari to remove a conviction, or order made by justices of the peace, must be applied for within six months. The removal of county court actions by certiorari is regulated by section 126 of the County Courts Act, 1888.

In the United States the superior court possesses an inherent right to issue this writ, but provision is very frequently made by statute for the exercise of this jurisdiction, both in civil and criminal matters, and on the same ground, generally speaking, as in England, namely, to arrive at substantial justice between the parties.

Certosa di Pavia, a Carthusian monastery a few miles from Pavia, founded in 1396 by one of the Visconti, Duke of Milan, in expiation of a murder. The cruciform church has a beautiful fifteenth-century façade designed by Borgognone. There is a good high altar, a mausoleum of the founder, and an extraordinary profusion of rich marbles, paintings, and other valuable decorations. The monastery is now a national monument. Francis I. of France was a prisoner here in 1525 after the battle of Pavia.

Cerussite, an important ore of lead, consisting of the carbonate of this metal, $PbCO_3$. It occurs in rhombic crystals, varying in colour from white to greyish-black. It is brittle, and has a sp. gr. 6·4, and is sometimes associated with the chloride of lead, and is then known as horn lead. It occurs in various localities in the United States, in Siberia, Hungary, Bohemia, the Harz, at Leadhills in Scotland, Wicklow in Ireland, and Cornwall and Derbyshire in England.

Cervantes Saavedra, MIGUEL (1547–1616), a celebrated Spanish soldier, and better known as the author of the immortal *Don Quixote*. He was a native of New Castile, and, like Homer, he was claimed as a native by seven cities. The ancestors of Cervantes came at an early date from Galicia, and appear to have settled at Alcala de Henares, which was the birthplace of Miguel. Not much is known of his youth beyond what may be gathered from his works, but it is clear that he received a fair education, and in 1568 he is mentioned as succeeding in a poetical competition upon the occasion of the funeral of Isabel, wife of Philip II. In the same year we find him at Madrid as the page of Cardinal Acquaviva, whom he accompanied to Rome. In 1570 he entered the army at an epoch when the Spanish arms were at the height of their renown, and his first campaign was at sea. At the battle of Lepanto he got out of a sick bed in spite of remonstrance, and so bore himself as to attract the notice of the commander-in-chief, Don John of Austria. In 1573 Cervantes took part in the expedition of Don John against Tunis, and in 1575, while returning upon leave from the army in Italy, he was captured by Algerine pirates. He remained in slavery for five years, and has recorded his experiences in *Don Quixote*. He again joined the army, but his services were forgotten, and in 1583 he quitted the army and returned to literature. One work of this period was a prose pastoral, *Galatea*, which he criticises in *Don Quixote*, and which appears to be neither better nor worse than the ordinary stilted poetry of the period. In 1584 Cervantes married, and continued to write poetry and dramatic pieces which seem to have had much success. But he could not compete with Lope de Vega as a dramatist, and the next twenty years of his life were passed in a struggle with poverty which almost precluded him from writing. In 1588 he was employed in the victualling of the Invincible Armada; in 1598 he wrote a sonnet ridiculing the extravagant pomp which marked the funeral of Philip II., and in 1603 he was among the crowd of those who vainly expected something from the new Court. It was in 1605 that he published the first part of *Don Quixote*, which, in spite of its literary defects and marks of carelessness, had a great success. Those who missed its points as a satire aimed at the extravagant romances of chivalry which marked the decadence of chivalry itself, enjoyed the work as an entertaining book, and the many editions were a proof of its popularity. Between the first and second parts of *Don Quixote* a period of great literary activity intervenes. He published among other works some stories which were full of incident, and are said to have inspired Sir Walter Scott with the idea of writing the *Waverley Novels*. Before the second part of *Don Quixote* appeared, a spurious second part was

issued, as to whose authorship there is some controversy, but the general opinion is that it was the work of one Aliaga, the confessor of the Duke of Lerma, and Lope de Vega is not without suspicion of having been concerned in the attempt to bring a brother dramatist into contempt. In 1615 Cervantes's own second part appeared, and quickly demolished the reputation of the spurious one. The fame of the work spread through many lands, since, like Shakspeare, Cervantes wrote for all time, and foreigners who visited Madrid made it their first business to inquire after the author of *Don Quixote*. He died in the same year and almost on the same day as Shakspeare; and his country, that cared little for him during life, cannot now say what became of his bones. But the principle that the blood of the martyrs is the seed of the church is as true of literature as of other religions, and Cervantes's country extends far beyond Spain. There are few to whom *Don Quixote* is not dear, or who have not enjoyed the mingled shrewdness and simplicity of Sancho. Had Sancho not existed we should never have seen a Planchet or an Andrew Fairservice.

Cervidæ. [DEER.]

Cesarevitch (*son of Cæsar*), the eldest son and heir of the Czar of Russia. Originally the title was applied to any of the sons, and it was introduced as a title for his second son by the Czar Paul at the end of the last century.

Cesarotti Melchior (1730–1808), an Italian poet, who, born at Padua, became professor of rhetoric at the university there, and at the age of 38 professor of Greek and Hebrew. For his services in the French cause he was pensioned and made a Knight of the Iron Cross by Napoleon I. He is chiefly known as the translator of *Homer* and *Ossian*. Among his other works are a *Course of Greek Literature*, an essay on the *Philosophy of Language*, and one on the *Philosophy of Taste*.

Cesena, a cathedral town of Central Italy, 12 miles S.E. of Forli, has a trade in silk, hemp, wine, and sulphur, and produces good brick earth. Two Popes—Pius VI. and Pius VII.—were born here, and there is a celebrated shrine of Madonna del Monte. This town was one of the first to revolt from the Papal authority in 1859.

Cessio Bonorum (in Roman law) signified a debtor's surrender of his property to his creditors. It did not operate as a discharge of his debts unless the property surrendered was adequate to their discharge, if otherwise after acquired property was available for their liquidation, so that the debtor was not left in want. Therefore *Cessio bonorum* operated as a discharge *pro tanto* only. In Holland, according to Huberus, it did not even exempt the debtor from imprisonment, unless the creditors acquiesced, and the same law prevails in many parts of Germany. In Scotland the law on this subject is similar to that of the Roman Code in its principal features.* The modern code of France adopts the same system. *Cessio bonorum* amounts to an act of bankruptcy in England.

* By an important statute passed in 1881 the debtor under a *cessio* may obtain a statutory discharge in case of his paying 5s. in the £ to his creditors, or satisfying the sheriff that it is not his fault such a dividend has not been forthcoming.

Cestoidea, one of the classes of flat worms or PLATYELMINTHES. They are unisegmental, or else appear to be falsely segmental, as the body is composed of many joints known as "proglottides." They are all parasitic, and therefore are degraded: they have no organs of special sense, or definite digestive tract. The body or "strobila," as the full sexual form is called, consists of three main parts: the head or proscolex, the neck and the joints or proglottides. The former contains the hooks or suckers by which the worm attaches itself to the wall of the intestine of its host (the animal in which it is parasitic). The head may have four suckers and a circle of hooks, as in the common *Taenia* or tapeworm; or may have four suckers and four processes, or "proboscide" armed with hooks; or it may be provided only with a pair of sucking grooves. The head and neck form the scolex. The neck is short, and normally gives origin to a series of "proglottides," or joints which are shed when mature. Each joint contains a complete set of generative organs and excretory vessels, also a pair of lateral nerve cords, which run down the whole length of the body from the single anterior nerve ganglion. But in some cases the proglottides are not well defined, as in the genus *Bothrioeephalus*, which infests the dog and horse, etc.; while they are not developed at all in the family *Caryophyllæidæ*, which inhabit certain fish (Cyprinoids). The Cestoidea are hermaphrodite, each ripe joint containing a set of both male and female organs: these are somewhat complex. [TAPEWORM.] The most striking feature in this class is the life history. The eggs are swallowed by some animal, generally one that feeds on vegetable material; when in the stomach of this, the gastric fluid dissolves the strong leathery coat in which the eggs are protected, and the embryo absorbs the digestive juices. The head is then developed, and by its hard jaws burrows its way through the walls of the stomach or intestine, and settles in the tissues of the host: it there becomes "encysted," *i.e.* it enters upon its resting stage, inclosed in a thick case. In this condition it remains till its host is eaten by some carnivorous animal. The cyst having been ruptured or dissolved, the larval worm continues its development. The scolex, composed of the head and neck, is first formed, and by the suckers or hooks on the head attaches itself to the wall of the intestine: it absorbs the food material prepared by the host, and soon develops the joints or proglottides. These increase in size from before backward; new ones are formed immediately behind the head: the oldest and largest ones are shed when mature.

The origin of the Cestoidea is a somewhat obscure problem. It has been thought that the proglottides are a case of serial gemmation comparable to that of some Tunicates, etc., [SALPA], and that the whole life history is but a case of Alternation of Generations (q.v.). This view involves the idea that the proglottides are to be considered to some extent as individuals. That, however, can hardly be the case, on account of the

continuity of the various body-systems, notably the nervous system, from the head right through the proglottides. It seems more probable that the scolex and proscolex are both to be regarded as non-sexual forms, which only become sexual under the more favourable conditions of food supply, etc., offered by the second host. The scolex and proscolex in fact may be only organs of adhesion, a view urged by Moniez. The latter view, which does not apply the phenomenon of alternation of generations, gains support by the facts that in one case (*Ligula*) the joints are developed in the first host, while in another (*Archigetes*) the whole life history is completed in the one host—the small red river worm *Tubifex;* this latter case is of interest, moreover, as the only Cestoid parasitic on an invertebrate. There are six families included in the Cestoidea.

Cestracion, a genus of sharks, the type of a family which has existed from Devonian times, and has numerous fossil genera in later formations, all far exceeding the single living genus in size. The dentition of the whole family is adapted for seizing and crushing the crustaceans and molluscs which formed their food, and the living species are similarly provided with blunt pad-like teeth. In *Cestracion* there is no nictitating membrane; two dorsal fins are present, each with a spine in front. The spiracles, just under the eye, are small, and the gill-slits narrow. Four species, none over five feet long, are known; from Japan, Amboyna, Australia, California, and the Galapagos. The best known is probably *C. philippi*, the Port Jackson shark. The egg is deposited in a pear-shaped leathery case, round which are two broad ridges or plates.

Cestus, (1) the thongs wound round their hands and arms by Greek and Roman boxers, to give greater strength and force to their blows. Under the Roman Empire those used in the games were most formidable instruments, heavily loaded with lead and iron and sometimes studded with nails. There were several kinds. A single blow from the heaviest was sufficient to cause death. (2) A kind of girdle worn by women; especially (in mythology) the fabled girdle of Venus (Aphrodite) adorned with amorous devices.

Cetacea, an order of aquatic mammals, widely distributed in all seas, with some forms that live in, and others that from time to time ascend large rivers. The order dates from Eocene times, and fossil species occur down to post-Pliocene times. Professor Flower thinks that the Cetacea are closely related to the Ungulates, and that their origin was fluviatile, while Dr. Murie is of opinion that the order "taken as a whole does not show substantial links of affinity with the other marine mammalia or with the land mammalian groups." The general conformation is fish-like; the tail is developed into a powerful swimming organ by its horizontal expansion into "flukes." The head is very large, and produced into a kind of snout; the eye is small, and the external ear wanting. The skin is smooth, and immediately overlies a thick layer of fat—the blubber; there is generally a triangular dorsal fin; the fore limbs are reduced to paddles, and the hind limbs are absent or only indicated internally; the pelvis also is rudimentary. The nostrils, blowholes, or spiracles are generally on the top of the head, and the so-called "blowing" is only the ordinary breathing of these animals, which do not expel from these blowholes water taken in at the mouth, as is popularly but erroneously supposed. In size the Cetacea differ greatly—from four feet to sixty feet or more in length. They are generally inoffensive, and for the most part feed on small molluscs and crustacea, the grampus (q.v.) alone being carnivorous.

Ceterach, a genus of ferns, of which one species, *C. officinarum*, once supposed to be efficacious in diseases of the spleen, is not uncommon on limestone rocks in England. Having the sori on the under surface of the leaf hidden by thickly massed brown scales, it is known as the scale-fern.

Cetiosaurus, a genus of dinosaurian reptiles (q.v.), occurring in Jurassic and Lower Cretaceous rocks. It is referred by O. C. Marsh to the family *Morosauridæ*, of the order *Sauropodæ*, being herbivorous, and having its fore and hind limbs nearly equal, with solid limb-bones, five digits to each limb, and plantigrade feet furnished with claws. Its teeth were truncate and slightly serrate, like those of *Iguanodon* (q.v.). It seems to have been a marsh-loving or river-side animal, feeding upon the ferns, cycads or conifers, among which it lived, and reaching a height of not less than fifteen or twenty feet at the shoulder, with a length of sixty or seventy feet.

Cette, a French sea-port, in the department of Hérault, and about 20 miles S.W. of Montpelier, occupies the slope and the foot of a hill on a tongue of land that lies between the Mediterranean and the Lagoon of Thau. The harbour, protected by a mole and breakwater, is safe in all weathers, and will accommodate 400 vessels. Canals connect the port with the Rhone, and it has large inland as well as foreign trade. The chief exports are wine, brandy, salt, dried fruits, and fish, verdigris, and corks. There are many factories, and much sardine, cod, and oyster fishing is carried on.

Ceuta, a Spanish fortified fort on the coast of Morocco, opposite Gibraltar. Among the seven hills which gave its name to a Roman colony, which was once planted here, is Abyla (Hacho), one of the pillars of Hercules, now occupied by a fort, while upon a companion hill—Monte Almina—is the new town. The town, which is chiefly important as a military and convict station, has a cathedral and a bishop, who is the suffragan of Seville. There is a small harbour, and some trade. Under the Arab government Ceuta is said to have had the first paper factory of Western Europe. It was taken by Portugal in 1415, and became Spanish in 1580.

Cevadilla. [SABADILLA.]

Cevennes, a mountain range in Southern France, dividing the valley of the Rhone from those of the Loire and Garonne. Starting from the

Lyonnais mountains in the north, they run south-west, and extend to the Canal du Midi, which divides them from the Pyrenees. They are divided into several parts under different names, and have a length of about 150 miles. with an average height of 3,000 to 4,000 ft. In the Central Cevennes or Cevennes proper, Mount Lozère has a height of 5,000 ft., and to the north Mount Mezenc in Ardèche is 5,780 ft. The Loire, Allier, Lot, and Tarn take their rise in these mountains, which are rich in minerals, well cultivated on the upper slopes, while the upper slopes afford good pasturage, and the tops are clothed with chestnut and pine forests.

Ceylon, called by the Greeks and Romans Taprobane, in the *Arabian Nights* Serendib, known as the Pearl of the Eastern Seas, is an island lying to the S.E. of India, and is almost connected with the mainland by the line of coral reefs and sand-banks known as Adam's Bridge, and extending for 62 miles. The nearest point, however, to the mainland is about 40 miles from Cape Casimir on the Coromandel coast. The island is separated from the mainland by Palk Strait and the Gulf of Manar, and is pear-shaped, the point being towards the north. It lies between lat. 5° 55′ and 9° 51′ N. and long. 79° 41′ and 81° 54′ E., having an extreme length of 270 miles, and a breadth of 146 miles, with an area of 24,000 square miles. The north is occupied by plains which rise gradually to the central highlands, and consist of ridges alternating with upland valleys, the highest point being the Pedrotallagalla Peak (8,260 ft.), overlooking a plateau which is 6,000 ft. above sea-level. Other heights are Tolapella (7,720 ft.), Kirrigalpota (7,810 ft.), and Adam's Peak (7,420 ft.). This mountain system forms a complete watershed, from which flow a number of rivers, Ceylon being a very well-watered country. Of these rivers the most important is the Mahavila-Ganga, which rises in the plateau above-mentioned, and flows northward, falling into the sea on the east coast, near Trincomalee. On the west coast are the Kalani-Ganga, the Kala-Ganga, and the Maya Oya. The soil throughout the island is very fertile, and the vegetation varied and luxuriant. The wealth of the island consists chiefly in its plantations of cinnamon, coffee, and cocoanut, while in the lowlands of the north tobacco is grown, and of late tea has begun to be largely cultivated. The cinnamon groves are in the south-west in the neighbourhood of the capital, Colombo, while the coffee plantations occupy the mountain slopes and valleys. There is much valuable timber, especially satin-wood, ebony, and calamander; and there are tree ferns, palms, rhododendrons, and many varieties of orchid; while the animal world embraces the elephant, bear, leopard, wild boar, deer, buffalo, humped ox, civet, monkey, crocodile, tortoise, lizard, cobra di capello, boa and some other species of serpent; and the birds are of countless varieties, from the eagle to the swallow, the lakes and lagoons abounding in flamingoes. The insects are numerous and interesting, especially the leaf and stick insects. Minerals are in great abundance, the chief among them being iron, plumbago, manganese, nitre, alum, and salt, and precious stones are plentiful—rubies, amethysts, garnets, sapphires, and the catseye. The pearl-fishing is intermittent but important, being a Government monopoly, and under the supervision of an inspector who reports when the time is ripe for fishing.

The climate of Ceylon and the seasons resemble those of the Indian coast so far as the time and nature of the monsoons are concerned, but the temperature is greatly modified and equalised by the fact of Ceylon being an island; the average for the year at Colombo being 80°, while the great table-land, now used as a sanatorium, has an average of 62°, and seldom or never rises above 70° in the shade. Of the harbours, the best is that of Trincomalee, on the east coast. This is a beautiful harbour, safe, and of great extent, and is the principal naval station of the Indian Seas. But from the remoteness of Trincomalee from the chief districts, vessels generally use the roadstead of Colombo, which is protected by a breakwater, and affords a safe anchorage, or the harbour of Galle, which, though small and of difficult access, is a port of call for the principal lines of steamers running eastward and westward.

Ceylon forms a colony altogether distinct from India, and is administered by a Governor appointed by the Crown, and aided by an executive council of five and a legislative council of fifteen. Agents are over the six provinces into which the island is divided, and the Supreme, Civil, and Criminal Court is in the capital Colombo, which is united by a railway to the ancient inland capital Candy. The natives of Ceylon consist (1) of Singhalese, who are considered the descendants of Aryan colonists, who arrived in the island in 543 B.C., and whose feminine-looking dress, and mode of wearing long hair turned back and fastened with a comb, give them almost the appearance of women; (2) the Kandyans, a sturdy and independent race of Highlanders; (3) the Tamils, who are descended from invaders of South Hindustan, and excel in physique both Singhalese and Kandyans; (4) the Moormen, who are thought to be Arab; and (5) the Veddahs, a wild and debased race in the eastern parts of the island, who are thought to be aboriginal. There are also descendants of the former Portuguese and Dutch owners of Ceylon, who have been naturalised, and are called burghers.

The principal religion of the island is Buddhism (q.v.), mixed with some Brahmanism, and worship of Hindu deities, of which from time to time reformers endeavour to free themselves. Three times Buddha visited Ceylon, his footstep upon Adam's Peak is reverenced, and his sacred tooth is enshrined at Kandy. The Tamils are Brahman or Hindu in religion, and the Moormen Mohammedan.

The ancient ruins and traces of civilisation under the Singhalese kings are numerous and extensive, the remains of large cities having been found in the forests, and there are remains of magnificent tanks in various parts of the island. Among the many ancient temples and shrines of the past is the celebrated cave-temple of Dambula.

The first visit of the Portuguese to Ceylon was in 1505, and in 1517 they formed a trading settlement at Colombo. In 1658 they were driven out by

the Dutch, and in 1796 the Dutch possessions were ceded to England, and formally annexed to the Crown. The King of Kandy was deposed in 1815, and his territories annexed by the British.

Ceyx. [KINGFISHER.]

Châb, a large division of the Arab Bedouins, who migrated many centuries ago from Nejd to the region about the Euphrates and Tigris confluence, but who are now settled chiefly in South Khuzistan, Persia. All have become Shiahs, and many have intermarried with the Persians and adopted the Persian language. Eight branches: Ali Bû Nasr, Idris, Bawi (not originally Châbs), Nasara, Mohaisen, Beni Jemim, Haideri Hiyader. The Châb Sheikh is very friendly to the English, and commands great influence in the valley of the Karûn river, which has recently been opened to British trade.

Chabas, FRANÇOIS (1817–1882), a French Egyptologist, who, born at Briançon, was first engaged in commerce, but giving much of his time to study, became a great linguist, and in 1851 gave himself up to the deciphering of hieroglyphics. In 1856 he issued his first publication, and in a valuable series of works did much towards elucidating two important periods of Egyptian history—the conquest of the country by the Hyksos, and their expulsion. For four years he was editor of *L'Egyptologie.*

Chablis, a French town in the Yonne department, head of canton and arrondissement, on the Serein, and in the centre of a rich vine-growing district. It has a world-wide renown for its wine, which is easily king of white wines, and of which many more thousands of gallons are drunk than the district could possibly produce.

Chacma (*Cynocephalus porcarius*), the Pig-tailed Baboon, one of the largest species of the genus. It is a native of South Africa. The fur is uniform dark-brown, with a green shade; the face, ears, and hands, and feet, are dark violet-blue, and there is a pale ring round each eye. These animals are noted for their sense of smell, and their faculty of discovering hidden springs of water.

Chaconne, an old dance said to be of Spanish origin; the term is now applied in music to a composition, usually in 3—4 time, consisting of a series of variations on a "ground-bass." Bach's chaconne in his fourth sonata for the violin is a well-known example.

Chacriaba, a warlike Brazilian nation formerly dominant in the province of Goyaz, towards the frontier of Minas-Geraes. They were at constant feud with their Acroa neighbours, and also harassed the white colonists on the Parana river. But after repeated defeats, and unable to resist the firearms of the Portuguese, they submitted to Governor Vasconcellos, who settled them in the district of Rio-das-Pedras.

Chad, ST., flourished during the seventh century A.D. Born in Northumbria, and becoming a pupil of St. Aidan, he went to Ireland in youth. In 666 he was made Archbishop of York, but resigning this appointment three years afterwards, he became bishop of Mercia, and chose Lichfield as the seat of his diocese, finally dying in 672.

Chadwick, EDWIN, a social reformer, was born at Manchester in 1801, and called to the bar in 1830. An article on Life Assurance attracted the attention of Jeremy Bentham, and the Government appointed him assistant commissioner to inquire into the operations of the poor-laws. Much of the present working of them is founded upon his report. He was appointed secretary to the Poor-law Board, and was also connected with the Board of Health. In 1843 he was instrumental in bringing about the change of law with reference to burials in towns, and he was on a commission relative to the employment of children in factories, and on education. He retired with a pension from the Board of Health in 1854, and died in 1891.

Chæronea, a town of Bœotia (ancient Greece) near the Cephissus, the birthplace of Plutarch, and remarkable as the spot where Philip of Macedon defeated the Athenians and Bœotians in 338 B.C., and put an end to Greek liberty. Here, too, Sulla, in 86 B.C., defeated the generals of Mithridates. A marble lion in four pieces, dug up in 1880, together with many bones, is thought to be a relic of the former of the above-mentioned battles.

Chætifera, one of the two divisions of the GEPHYREA class of Worms. This order seems the more primitive of the two, and if so it strongly supports the view of the Annelidan origin of this class. The Chætifera are, at least in early stages, composed of several segments; they have a long proboscis (or "prostomium") which is protrusible at the anterior end of the body; the mouth opens at the junction of this with the body. There is one pair of setæ which may represent the last of a series which have been lost. The anus is terminal, and the hindmost pair of excretory organs or "nephridia" open into the rectum close by the anus. There are several pairs of anterior nephridia. Thus the segmentation of the ancestral form is indicated by three points: the external segmentation, the pair of setæ, and the pairs of nephridia. In some cases the embryro is small, and resembles a minute Planarian (q.v.).

Chætoderma is a genus of GASTROPODA, remarkable for being either very primitive or degraded. It belongs to the group of ISOPLEURA, of which *Chiton* is the best known form. It differs from that genus in four main points: the shell is represented only by a few spines or spicules; the mantle is reduced to a mere collar round the anus; the radula or complex armed tongue of other Gastropods is but a single tooth; the "ctenidia" or gills are represented by only one pair instead of a considerable number. These features are suggestive of degradation rather than of primitive structure.

Chætodon, the type-genus of Squamipinnes (formerly, and sometimes still, called Chætodontidæ), a family of Acanthopterygian fishes with numerous genera from tropical and sub-tropical seas. The species are for the most part brightly coloured and curiously marked, and are generally

found near coral-reefs, whence they are often called "coral-fishes." The body is greatly compressed and elevated, and the jaws are produced into a more or less elongated snout, in the front of which is the mouth; teeth small and slender, and arranged in bands. The anal and dorsal fins are so covered with scales as to obliterate the distinction between them and the body. The type-genus contains about 70 species from the tropical parts of the Atlantic and the coral-reefs of the Indo-Pacific. [ARCHER-FISH.]

Chætognatha, a class of small marine worms: they are all free swimming, and live as a rule on the surface of the sea far from land. A few species occur, however, in the seas around the British islands, and one (*Spadella cephaloptera*) is actually a shore-dweller, and fastens its eggs to algæ. The class includes but two genera, *Sagitta* and *Spadella*. The main features in their anatomy are these: The body is divided by two septa into three regions. The mouth is a small slit on the ventral surface of the body: it is guarded by folds armed with spines and by series of hairs (setæ) on the jaws. There are one or two lateral fins, and one on the tail. The anus is ventral, and opens at the junction of the body and tail. The nervous system consists of two ganglia, one anterior above the digestive tract, and one below it near the centre of the body. These are connected by series of nerves. There are two eyes. The *Sagittæ* are hermaphrodite. The group is one of much interest, as it is small, and occupies a very isolated position in the great phylum of the Worms.

Chætopoda is a great group of Round Worms, which includes those which bear setæ. They are composed of many similar segments, with a head or "prostomium." The nervous system consists of a pair of cerebral ganglia, and a paired cord typically running along the middle of the under side. The excretory organs or nephridia are repeated in a series of pairs, usually one in each segment of the body; but the number may be limited as to six in the "lob worm" (*Arenicola piscatorum*), or there may be many in each somite as in *Acanthodrilus multiporus*. The generative organs may or may not be repeated: the worms are either hermaphrodite, as the "Earthworm" and most OLIGOCHÆTA, or there may be two separate sexes as in most POLYCHÆTA. The setæ are the most characteristic structures: they may be very conspicuous, as in many Polychæta, in some of which, as in *Aphrodite*, the "sea mouse," they are woven into an iridescent felt; or they may be small and few, as in the Earthworm, or even absent, as in the genera *Ælosoma* and *Anachæta*. In the Polychæta they are borne on two lateral processes known as "parapodia:" these are composed of two lobes, a dorsal, or "notopodium," and a ventral or "neuropodium." Each of these may also bear a series of respiratory tufted branches, or "cirri." In some cases the cirri may be simple, and flattened out into scale-like "elytra" which protect the exposed dorsal surface, as in *Polynoë;* these may, however, retain their respiratory function as well as being protective. In most cases the anus is terminal, but in a few there are some small postanal somites, as in *Criodrilus*. Many forms are armed with teeth, as in some species of the family *Syllidæ*. These are perforated by a poison canal. As to mode of life they are either terrestrial, as most Oligochæta, *e.g.* the earthworm, or aquatic, whether marine as most Polychæta or freshwater as *Tubifex:* some are free-swimming, as the *Errantia*, others live in tubes as *Serpula*, or burrow through mud and sandbanks as *Arenicola*. The only freshwater Polychæta are a few species of *Lumbriconeis*. A few are parasitic, such as *Oligognathus bonelliæ* in some Gephyreans. The Chætopoda are divided into four orders, the OLIGOCHÆTA, POLYCHÆTA, ARCHIANNELIDA, and ARCHICHÆTOPODA.

Chaffinch (*Fringilla cœlebs*), a very common British finch (q.v.), and probably the species whose call-note, which has been rendered *pink*, *fink*, and *twink*, obtained for it the name, which has been extended to the whole family Fringillidæ. The specific name (= bachelor) was chosen by Linnæus, because in Sweden the hens were said to leave the country in the winter, while the cocks did not; and it seems to be the fact that in the migration from Britain the hens precede the male birds, and that those which do remain are principally males. The chaffinch is common in Europe and North Africa, ranging east to Asia and west to the Azores. The adult male is about 6 in. long, and in its summer dress has the top of the head (where the feathers are slightly erectile) and nape bluish-grey, the back chestnut, the wings dark with two white bars, and the tail nearly black. The plumage of the hen is much less brilliant, and the young males resemble the adult females, but have the colours more blended. The song is clear and trilling. These birds live chiefly on insects, with which they also feed their young, the old birds at that time subsisting on seeds and grain. The nest is a beautiful structure, covered externally with lichen, and usually containing four or five purplish-buff eggs, streaked and spotted with brown.

Chagatai (Jagatai), a cultivated Turki language current in Bokhara, Khiva, and Ferghâna, mixed with Arabic and Persian elements; in this idiom are written the Emperor Baber's *Memoirs* (16th century). The name, which is also applied to the Turki (Tatar) peoples of Eastern Turkistan, is taken from Chagatai, Jenghis Khan's second son, who in the partition of the empire inherited this region, and whose successors held it till the Mongol dynasty was overthrown by Timur Beg. The Chagatai state was later divided into Moghulistan and Mawerannahr (Transoxiana). But most of the Nomad populations of E. Turkistan are of Turki stock; hence the so-called Chagatai tribes and Chagatai speech are Tatar, not Mongolian, although Chagatai himself was a pure Mongolian. Ignorance of this fact has caused immense confusion in most works on the ethnology of the Mongolo-Tatar peoples.

Chagres, a town of the United States of Colombia on the N. coast of the Isthmus of Panama, 12 miles from Colon, and at the mouth of the Chagres river. At the time of the Californian gold fever Chagres

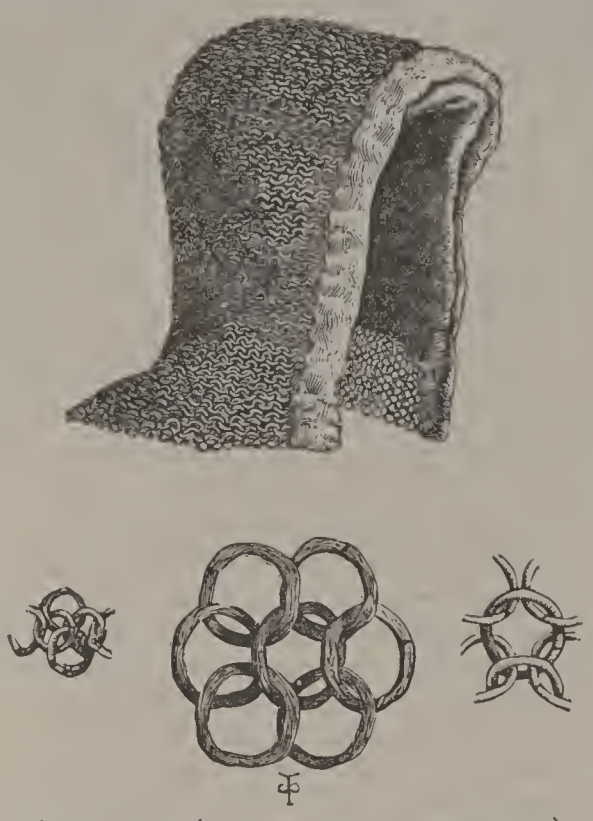
was of much importance, but is now decayed, especially since the opening of the railway from Panama to Aspinwall. The Panama Canal for part of its course follows the Chagres Valley.

Chaima (Chayma), a large Venezuelan nation in the Punceres mountains, and in Caño Colorado, between Aragua and the Gulf of Paria; at the time of Humboldt's visit (1800) they numbered 15,000, but have since been reduced; short stature, slit eyes, high cheek-bones, black lank hair, sparse beard, very light or sallow complexion. Dana says they might be taken for Creoles, but for their greater modesty (*Recollections of Four Years in Venezuela*). The language seems to show Carib affinities, but many now speak Spanish. A treatise on it was composed by P. Tauste in the 17th century, entitled *Vocabulario y Arte de la Lengua de los Indios Chaymas.*

Chain, in *Surveying*, is an appliance for measuring lengths, introduced by Gunter. It is composed of 100 links of iron or steel, each 7·92 inches long, and making a total length of 22 yards. In very accurate work allowance is made for expansion due to increase of temperature. Ten square chains, or 100,000 square links, make one acre. Areas may often be accurately surveyed by use of the chain only; this dispenses with any measurement of angles by dividing the area into well-shaped triangles, each of which is determined by the lengths of its sides. Irregularities of the boundary, etc., are measured by offsets. [SURVEYING.]

Chain-making is an important mechanical industry. For the past twenty years from 15,000 to 20,000 tons of chain have annually passed inspection, and withstood the regulation tests in England. The manufacture of very small chains affords employment to women and children, but all heavy work requires the skilled labour of men trained to this special smiths' work. The links in a chain are either *unstudded* or *studded*. The former type of link is made of a bar of proper length and thickness, heated to a suitable temperature, and bent into a loop so that the ends meet. These ends are then welded together, and while still soft the link is worked to the required shape, and a finish is given to the weld. Additional links are threaded on to the previously-made one before being welded. The *studded* link, used for chains of over one inch diameter, is closed at the side and strengthened laterally by a *stud* welded across its width, thus dividing the link into two parts. Chains must be capable of resisting sudden shock; their material must, therefore, not be brittle. They must also withstand heavy, steady loads; thus the iron employed in their manufacture is required to possess great tensile strength, as well as considerable ductility. Lloyd's tests consist of the application of a standard stress to every 15-fathom length of chain, sufficient to exhibit weakness in any part without injuring any satisfactory specimen. Also pieces of chain are cut at random from any part of each length, and subjected to a stress 50 per cent. above the standard, the cut portion being linked up again. These tests proving satisfactory the quality of the chain is certified.

Chain Mail, a kind of armour made of interlaced rings or links (as in the illustration) and



CHAIN MAIL (HOOD AND SEPARATE LINKS).

fitting tolerably closely to the body. It was common in the Middle Ages.

Chain-pump, a machine for raising water. It consists of two vertical barrels ranged side by side, square in section, containing an endless chain passing up one and down the other. At suitable intervals along the chain pistons are attached, which, by the ordinary pump principle, are arranged to lift water up one barrel. The machine is now an antiquity.

Chair, RAILWAY, a cast-iron pedestal or socket for holding and securing railway lines. The chair is pinned on to the level surface of the sleepers, and the rail fixed in it by a wedge of wood driven in horizontally between the outer cheek of the chair and the rail itself. [RAILWAY.]

Chakkar 1. A Mongol tribe, Ili Valley, Kulja, originally from the N.W. frontier of China. 2. A branch of the Khalkas (Eastern Mongolians), S.E. of the Gobi desert towards Kalgan. Their territory is nearly 500 miles long east and west, by 130 broad. In recent times they have become much mixed with the Chinese, whom they now resemble in features, "having generally a drawn or angular rather than a flat or round face" (Prjevalsky, *Mongolia*, i. p. 33). The Chakkars form eight Koshongs ("banners") under hereditary princes.

Chalaza, a Greek word meaning a tubercle, is applied in botany to the structural base of the ovule (q.v.), at which point the vascular bundle of the seed generally terminates, and the integuments (*secundine* and *primine*) spring from the body of the ovule (*nucellus* or *tercine*). In inverted or *anatropous* ovules the chalaza is actually at the

top of the ovule, *i.e.* at the end farthest from the placenta. In the exceptional type *Casuarina* the pollen-tube pierces the chalaza, whence Treub has separated this genus from all other angiosperms as a subdivision *Chalazogamæ*.

Chalcedon, or CALCHEDON, a coast town of ancient Bithynia in Asia Minor, almost opposite Byzantium, and south of the present town of Scutari. It was founded by a colony from Megara, and was called the City of the Blind, as being founded by those who could not see the greater advantages of the site upon the opposite coast. It was taken by the Persians, was made a free city under the Roman Empire, was again taken by the Persians in 616 A.D., and was finally demolished by the Turks, who took its ruins as building material for Constantinople. The fourth Œcumenical Council was held here in 451 A.D. to settle points disputed by the Monophysites and the Nestorians.

Chalcedony, named from Chalcedon in Asia Minor, is a crypto-crystalline mixture of quartz and opal. It occurs in stalactitic or mammillated forms, in flint-nodules, and in agates, with a radiating acicular crystallisation at right angles to the surface of the bosses. It is rather waxy in lustre, and varies much in colour, *carnelian* (q.v.) or *sard* being the red or brownish-red variety; *prasc*, leek-green; *plasma*, the same colour, but more translucent; *chrysoprasc*, an apple-green; *onyx*, a regularly-banded form, white and bluish-grey; and *sardonyx*, similar, but red and white.

Chalcididæ, CHALCIDÆ, a family of small lizards, of which the genus Chalcides or Chalcis is the type. According to Wallace, it contains three genera and eight species, and is characteristic of Central America.

Chalcis, the capital of Eubœa, on the Euripus, a strait or stream 120 ft. wide. The navigable channel of this strait has recently been widened, and it is crossed by a bridge. This ancient city was of much importance for its trade, and also as a great centre of colonisation, as it sent colonies to Italy, Sicily, and Macedonia, where it gave its name to the Peninsula of Chalcidice. In the Middle Ages the Venetians held it, and it was taken by the Turks in 1470. The philosopher Aristotle died here.

Chaldæans (Kaldani), Semitic Christian communities in Mossul, the Kurdistan Mountains, opposite Lake Urumiah, and elsewhere in Persia and Turkey; by some supposed to be descended from the ten lost tribes, by others to represent the old Assyrians; commonly but wrongly called "Nestorians," being simply Eastern Christians with a national liturgy. The term Kaldi occurs in Assyrian cuneiform writings at least 900 years before Christ as the national name of the later Babylonians ("Chaldæans"), who were of Semitic stock and speech, closely allied to the Assyrians. The present speech (Chaldee) is a corrupt Aramaic (Syriac) dialect written in a modified form of the Estranghelo (Old Syriac) alphabet. Amongst them American Protestant missionaries have long been at work. [NESTORIANS.]

Chaldee. [CHALDÆANS.]

Chalfont St. Giles, a village of Buckinghamshire, a few miles from Aylesbury, and noted as the residence of Milton, whose cottage still exists.

Chalice (Lat. *calix*, a cup). The term is applied almost exclusively to the cup in which the consecrated wine is administered at Holy Communion. The chalice was formerly often covered by a plate or paten containing the consecrated elements. Old chalices, particularly those of the 15th and 16th centuries, are often elaborately decorated and ornamented with precious stones. The legality of the "mixed chalice," *i.e.* of mixing water with the consecrated wine, has recently been a subject of controversy in the Church of England.

Chalk, an earthy form of limestone, belonging mostly to the upper part of the Cretaceous system (q.v.). It is usually white, but sometimes grey, red, or greenish; is very friable, breaking with an uneven fracture, and has an insipid taste. In addition to carbonate of lime ($CaCO_3$), chalk usually contains some silica, iron-oxide, and alumina, the Red Chalk of Hunstanton, in Norfolk, containing more than nine per cent. of these impurities. On microscopic examination chalk is found to consist mainly of the shells of *Globigerina* and other Foraminifera (q.v.), thus presenting some analogy to the white ooze now forming in the deep Atlantic. Chalk occurs in thin beds under the Tertiary volcanic rocks of Mull, Morven, and Antrim, where it is baked so as sometimes to have become marble (q.v.). From the western Midlands it has been removed, leaving behind its less destructible flints, and now extends as an escarpment from the borders of Devon and Dorset, through Salisbury Plain, the Hampshire and Berks downs, the Chiltern and Gogmagog hills, and the wolds of Norfolk and Lincoln, to Flamborough Head. A downward fold carries it under the London basin, and parallel upward curves form the North and South Downs, ending in the Forelands and Beachy Head, and the downs of the Isle of Wight. On the Continent it extends to the Crimea and from the south of Sweden to Bordeaux, over about 1,100 miles in one direction, and nearly 900 in the other. It varies in thickness from 600 to 1,000 feet, and its general freedom from sand and pebbles points to its formation in open sea, though masses of granitic rocks, believed to have been carried by ice, have been found in it. Besides the minute foraminifers, the most characteristic fossils of the Chalk are sponges, often in the flint-nodules that occur in lines in the Upper Chalk, sea-urchins in great numbers, brachiopods, such as *Terebratula* (q.v.), scallops, oysters, the bivalve genus *Inoceramus*, ammonites, the teeth of sharks and rays, and the bones of turtles and saurian reptiles. Some of these being confined to certain parts of the formation, it has been divided into zones which are grouped in three main divisions, bearing names of French origin—the *Cenomanian*, impure and marly, including the Grey Chalk of Folkestone and Totternhoe stone; the Turonian, or Lower Chalk without flints, surmounted by the Chalk Rock of Dover; and the Senonian, or Upper Chalk with flints. Chalk, being very porous, is an important

water-bearing formation, all the deep wells of London being sunk into it. The water is hard, but softens on boiling. Chalk forms a poor soil, but is generally covered with "clay with flints," a ferruginous clay residue from dissolved upper layers, which bears a close turf suitable for sheep-grazing, or is fitted for root-crops. Chalk is largely used for dressing clay lands, for lime-burning or cement-making, and in making carbonate of soda, carbonic acid, paints, and tooth-powder. *Whiting* is simply fine pure chalk triturated with water and re-precipitated. Chalk is used in medicine as a desiccant and as an antacid. *French chalk* is an entirely different substance, an earthy form of talc (q.v.), and forms the basis of rouge and of some coloured crayons.

Challenger Expedition, a scientific exploring expedition sent out by the British Government, under the command of Captain Nares, in 1872. The results obtained by a previous expedition, equipped on a much smaller scale, of H.M.S. *Porcupine*, induced the Government to send out H.M.S. *Challenger*, a screw corvette, specially fitted with appliances for deep-sea dredging and other scientific purposes, and with a staff of scientific observers, on a cruise round the world. The ship was away four years ; striking additions were made especially to our knowledge of the physical geography and geology of the ocean depths ; and also to that of the botany and ethnography of many remote parts of the globe. A series of reports edited by Sir Wyville Thompson has been published by order of the Government, and the late Professor Moseley and others have dealt in a more popular manner with the cruise and its results.

Challis, JAMES (1803–1882), an English astronomer, born at Braintree in Essex, and educated at Cambridge, becoming senior wrangler and Smith's Prizeman in 1825. In 1836 he was appointed professor of astronomy at Cambridge, and was till 1861 director of the Cambridge observatory, where he noted the position of the planet Neptune before its discovery at Berlin in September, 1846. Among other works he published in 1861 a work on the plan and development of the Creation in answer to the *Mosaic Cosmogony* in the *Essays and Reviews*.

Challoner, RICHARD, Roman Catholic prelate, was born in 1691 at Lewes, Sussex. Though his father was a dissenter, he became a Roman Catholic and professor at the English College, Douay. In 1730 he came to London as a missionary, and in 1741 was raised to the episcopal dignity at Hammersmith, with the title Bishop of Debra. At the time of the "No Popery" riots of 1780 he had to secrete himself, being at that time Vicar-Apostolic of the London district. He wrote numerous controversial works, the best known among which, the *Catholic Christian Instructor*, was a reply to Conyers Middleton's *Letters from Rome*. His *Garden of the Soul* is still one of the most popular devotional books amongst Catholics, and his Douay version of the Scriptures is still used by them. He died in 1781 in London.

Chalmers, GEORGE PAUL, artist, was born in 1833 at Montrose. Though of humble origin, he yet determined to become an artist, and in 1853 removed to Edinburgh and studied under Scott Lauder. His first hit was made by the *Favourite Air* produced in 1854, and in 1867 he was made an associate of the Royal Scottish Academy. Among his works, which also included portraits, were *Prayer*, *End of Harvest*, and *Running Water*. He died through injuries in 1878.

Chalmers, THOMAS, D.D., LL.D., theologian, was born in 1780 at Anstruther, Fifeshire. After a course at the University of St. Andrew's, he was at the age of nineteen licensed to preach, and in 1803 was ordained minister of Kilmany. In 1815 he became minister of Tron Church, Glasgow, and by his oratory sprang into great popularity—a volume of his sermons reaching the enormous sale of 20,000 copies in a twelvemonth. He next found vent for his extraordinary powers in the parish of St. John's, inhabited mostly by work-people, and the spiritually and intellectually neglected classes. To his care was entrusted the management of the poor, and he reduced the expenditure on them from £1,400 to £280 per annum. In 1823 he accepted the moral philosophy chair in St. Andrew's, and in 1828 he was transferred to the chair of theology at Edinburgh. At this period the majority of his brilliant writings were produced, including a work on political economy and his Bridgewater treatise, *On the Adaptation of External Nature to the Moral and Intellectual Constitution of Man*. In 1834 he became head of the church extension committee, and such was his zeal and the enthusiasm that he evoked that in seven years 220 new churches were built. Meanwhile the seeds of the disruption were sown. The evangelical party being in the majority in the General Assembly, it was there asserted that the majority of a congregation should have the right to elect its minister. The decisions of the civil courts against this principle led to Chalmers's withdrawal in 1843 from the Established Church, and with him also withdrew 470 other ministers. These formed the Free Church, whose first moderator was Chalmers. He was also appointed principal of the Free Church College. This singularly gifted man died at Edinburgh in 1847 while still engaged in the performance of his duties. Among his works, which have had great influence upon Scottish life and thought, were :—*The Application of Christianity to the Commercial and Ordinary Affairs of Life*, 1820 ; *The Evidence and Authority of the Christian Revelation*, 1824 ; *Lectures on the Establishment and Extension of Local Churches*, 1838 ; *The Efficacy of Prayer Consistent with the Uniformity of Nature*, 1849 ; and *Horæ Biblicæ Quotidianæ*, 1853.

Châlons-sur-Marne, a French city, capital of the department of Marne, is situated on the right bank of the Marne river. It is the town of the *Catalauni* of antiquity, and was the scene of the defeat of Attila by the Romans in 451 A.D. Among its buildings are the Gothic cathedral, the Hôtel de Ville, built in 1772, and the Prefecture, built in 1764, and reputed one of the finest buildings

of its class in France. In its beautiful park were some fine elms, which the Germans during the Franco-Prussian war cut down for fuel. In 1856 Napoleon III. formed a camp in the neighbourhood for the training of French troops. It has a trade in champagne, and among its industries are woollens and cottons.

Châlons-sur-Saône, a French town in the department of Saône-et-Loire, is situated on the right bank of the Saône river. Its most notable buildings are the church of St. Vincent, which dates from the fourteenth century, the church of St. Pierre, the exchange and commercial college. Its industries embrace iron-foundries, ship-building, glass, chemicals, and dye works.

Chalybeate Waters are those natural waters which contain iron in the state of protoxide or carbonate, or less frequently as sulphate or crenate. The quantity present is usually from ·03 to ·12 per 1000 parts of water, and the best chalybeates contain also sodium carbonate, chloride and sulphate, and free carbon-dioxide, to which some of the curative effects are probably due. Some are strongly sulphuric or aluminated, *c.g.* Oak Orchard, New York, which has 10 grains of free sulphuric acid per pint. These are astringent and can only be used diluted. Chalybeate waters are rarely thermal. They are recommended for anæmia, but it is doubtful if the iron has any therapeutic effect. The stronger kinds are useful in scrofula and chronic diarrhœa. They have an inky taste, and often encrust surrounding objects with rust (hydrous iron-oxide).

Cham, French name for Ham, son of Noah, was the pseudonym adopted by Amédée de Noé, who was born in 1819 at Paris, and died there in 1879. He was the son of Comte de Noé, and studied art under Delaroche. In 1843, having become famous for the wit of his pencil, he began to contribute for the *Charivari*, his best hits being on social rather than political subjects. He was a pronounced sceptic. There are several good collections of his comic illustrations, notably *Douze Années Comiques* (1880) with an introductory essay by L. Halévy.

Cham (Tsiam), a historic nation of Indo-China which formerly occupied all the eastern seaboard from about 19° N. latitude to Cape St. James, but were gradually driven southwards, and at last broken into fragments by the Annamese in 1471; now confined to the S.E. corner of the peninsula, and to some districts in Camboja. The Chams have left monuments covered with inscriptions which appear to be written in a language intermediate between Cambojan and Malay. Are supposed by some ethnologists to represent the original stock of the Malay race, which afterwards spread from the Asiatic mainland over the ocean c world. *See* Bouillevaux, *Le Ciampa*, in *Annales de l'extrême Orient* (1879, 1881); Aymonier, *Excursions*, etc., Saigon, 1890.

Chamæleon, a genus of lizards of the group Vermilingues, with about 30 species, forming a family clearly marked off from all the other members of the order by external characters, as well as by their anatomical peculiarities. They are almost exclusively Ethiopian, abounding in Africa, while peculiar forms exist in Bourbon, Madagascar, and Fernando Po. The Common Chameleon (*C. vulgaris*) is found in the south of Spain, the north and south of Africa, ranging eastward to India and Ceylon. The body is flattened, and the skin of the back is serrated so as to form a kind of crest. The head is triangular, the eyes are large, circular, covered, except in the middle, with shagreen-like skin, and capable of independent movement in every direction. There is no external ear, and the mouth is a large slit. The tail is prehensile, and used to aid progression, and is generally twisted round a twig as a support. The skin resembles shagreen, and owing to the disposition of the pigment-cells the animals of this family have the power of changing colour in an extraordinary degree. The digits on each limb are divided into sets of two and three, and with these a bough is clasped somewhat after the fashion of a climbing bird. The chameleons possess a long fleshy tongue, with a sort of cup at the end; this organ can be protruded at will, and, when an insect comes within reach, is suddenly shot forth and as suddenly drawn back, the prey being secured by a viscid secretion from the tip. All these animals are arboreal in habits and extremely sluggish, lying in wait for, not hunting, their prey. The majority of them are oviparous, but a small South African species, kept in the ward-room of the *Challenger*, gave birth to three young ones. In one form from Madagascar, often made a distinct genus (*Rhampholeon spectrum*), the tail is too short to be prehensile, but the digits are modified so as to give additional power of grip. The spelling Chameleon is generally used for any individual of the family.

Chamærops, a genus of palms, including about a dozen species, of small size, with fan-shaped leaves. They occur farther north than other genera, *C. humilis*, a native of both shores of the Mediterranean, being the only European palm. Its leaves are made into hats, baskets, brooms, thatch, etc., and their fibre used instead of horsehair or camels' hair.

Chamba, a state of Northern India, is bounded on the north and west by the Cashmere territory, by a range of mountains separating it from Kashmir, on the east by the British *parganas* of Bangahal and Lahaul in Kangra district, and on the south by mountains separating it from the Kangra Valley. Its area is about 3,200 square miles. Among its rivers are the Ravee and Chenab, whose banks are lined with immense forests leased to the British Government. The chief town bears the same name and is situated on the Ravee.

Chamberlain is one having the management or direction of a chamber or chambers. The most important one is (1) the Lord Chamberlain of Great Britain, the sixth high officer of the Crown, having the government of the Palace at Westminster, and into whose custody are delivered on important occasions the keys of Westminster Hall. He disposes of the sword of state which is carried before the Queen when she comes to Parliament, and goes

on the right-hand side next to the Queen's person. He also has to provide all things in the House of Lords during the session, the Gentleman Usher of the Black Rod, Yeoman Usher, etc., being under his control. The office is hereditary. (2) There is also the "Lord Chamberlain of the Household," who has the superintendence of all officers belonging to the Queen's chambers, except the precincts of the bedchamber. The appointment to this office changes with the government of the day, and to the holder of it appertains the important jurisdiction of licensing theatres in the metropolis and all towns in which a royal palace is situated. (3) There is also the Chamberlain of the City of London, who is an officer elected by the freemen who are liverymen. The duties of this officer are judicial and administrative. He admits on oath all persons entitled to the freedom of the city, and hears and determines all matters of complaint between masters and apprentices. He has also the conservation of property of citizens who die intestate, leaving orphans, on the application of such orphans or others on their behalf, for which the Chamberlain is deemed in law a corporation sole, but such applications are now rarely made. He is also treasurer of the City of London, and receives a fixed salary.

Chamberlain, The Right Hon. Joseph, was born in 1836 in London. Educated at University College school, he thereafter entered the firm of Nettlefold, Birmingham, screw makers, retiring from business in 1874, the year in which he unsuccessfully opposed Mr. Roebuck at Sheffield. Two years later he was returned to Parliament for Birmingham (in the municipal politics of which town he had long taken a prominent part), and making an early impression, he was appointed President of the Board of Trade by Mr. Gladstone in 1880. He was long the reputed leader of the advanced wing of the Liberal party, and his attacks on the landed interest, together with the "unauthorised programme" of the Liberal party, which was generally believed to represent his views, and was issued just before the 1885 election, produced a considerable sensation. When Mr. Gladstone returned to office in 1886 he received the Presidency of the Local Government Board, which he resigned on Mr. Gladstone's Home Rule measures becoming known, and followed Lord Hartington into the Liberal Unionist party. The Bankruptcy Act is the measure chiefly associated with his name. He also made strenuous, though unsuccessful, efforts to amend the Merchant Shipping Acts.

Chamber of Commerce, an association of the principal merchants and traders of a town or district to promote and defend the interests of trade and commerce. The earliest known instance is at Marseilles at the end of the fourteenth century. This body consisted of a small number of representatives of merchants of the town, and seems to have had some share in the municipal government. It was formally reconstituted by Louis XIV., and during the last half of the seventeenth and beginning of the eighteenth century, chambers modelled upon it were formed in various French towns—Lille, Bayonne, Montpellier, Dunkirk, and others. The number of elected members was very small—ten or twelve—and certain Government officials presided or were members *ex officio*. The duty of the Chambers was to make representations to the Government with reference to the best means of promoting trade and commerce. These chambers were abolished at the Revolution, but restored in 1802 by Napoleon. During this century several laws have dealt with them, and they were finally reorganised by Napoleon III. as President and Emperor in 1851 and 1852. They are authorised by the Prefect of a department on the petition of the representatives of commerce or of some branch of commerce in that department, and after considering any objections. They are elected by and from the principal commercial men in the area (the department or arrondissement) which they represent, and their duty is to make representations to the Government with regard to the customs duties, legislation respecting commerce, and other matters affecting its interest, and to present plans for its better promotion. They also manage some public or semi-public institutions devoted to commerce—the bourses or exchanges, for instance—and may hold property.

Two Scottish chambers, those of Glasgow and Edinburgh, are legally incorporated, but the English chambers are all purely voluntary associations, elected from the commercial men (excluding retail traders and employés) in a town, and meeting at intervals to deliberate on matters affecting their common interest. A central organisation, the Associated Chambers of Commerce, was formed in 1882. The London Chamber has recently devised a scheme for the improvement of commercial education, while the Manchester Chamber rendered valuable support to the free trade agitation. In America such societies also exist, and in various continental countries; but the term in America is sometimes applied to the buildings where merchants meet to deal with one another. [Exchange.]

Chambers, Robert, LL.D., publisher and author, was born in 1802 at Peebles. His *Traditions of Edinburgh*, 1824, attracted the notice of Sir Walter Scott, and the encouragement thus earned stimulated him to further literary exertion. In 1832 he joined his brother William, the success of whose *Journal* was now assured. In 1844 appeared *Vestiges of Creation*, but not until ten years later was the author of this remarkable work known. He wrote many other books of historical and literary interest, but his health broke down through overwork, and he died at St. Andrew's in 1871.

Chambers, William, was born in 1800 at Peebles. On the removal of the family to Edinburgh he was in 1813 apprenticed to a bookseller, and in 1819 started in business for himself. His beginnings were small, and his struggles, most interestingly told in his *Story of a Long and Busy Life* by himself, were severe. At length, in 1832, he started *Chambers's Edinburgh Journal*, the famous pioneer of periodical literature. Thereafter, in conjunction with his brother, Robert, he produced several serial publications of a popular and informing character,

such as the *Cyclopædia of English Literature*, *Information for the People*, *Papers for the People*, and *Chambers's Encyclopædia*. He won the usual rewards of a well-spent life; was elected twice Lord Provost of the Scottish capital, was granted the degree of LL.D. by the university of Edinburgh, and shortly before his death was offered a baronetcy. He died in 1883.

Chambéry, a city of France, in the department of Savoy, is situated in a beautiful district on the river Laisse. It has a cathedral, the old castle of the Dukes of Savoy, and the palace of justice. It is an archbishop's see, and in its vicinity is the château of Les Charmettes, at one time Rousseau's residence. Among the town's manufactures are clocks, wine, soap, and textile fabrics. It has excellent baths and is a favourite summer resort.

Chambord, a village of France, in the department of Loir-et-Cher, is celebrated for its château, formerly one of the finest royal castles in France. This magnificent edifice was commenced in 1526 by Francis I., and completed under Louis XIV. As a residence of the French kings down to Louis XV. it acquired the name of the "Versailles of Touraine." Louis XV. gave it to Marshal Saxe, and Napoleon, in 1809, gave it to Marshal Berthier, from whose widow it was purchased in 1821 for 1,542,000 francs by some Legitimists and presented to the Duke of Bordeaux. Its park is about 21 miles in circumference, and reputed one of the finest in Europe.

Chambord, Henri Charles Ferdinand Marie Dieudonné, Comte de, was born in 1820 in Paris. His father, the Duc de Berri (q.v.), had been assassinated seven months before, and the day the child was baptised he, then Duke of Bordeaux, was presented with the château of Chambord (q.v.) by a group of Legitimists in the name of the people of France; hence the title, Comte de Chambord, assumed in 1844, by which he became generally known. Though Charles X., in the July revolution of 1830, abdicated in favour of his grandson, the young count was obliged to leave the country, and lived successively at Holyrood palace, Prague, Görz, and London. In 1841 he had the misfortune to be lamed for life by a fall from his horse. He is regarded to have lacked decision and to have neglected to seize the opportunity of becoming Henry V. three times—in 1848, in 1870, and in 1873. After a long illness he died at his castle of Frohsdorf, in Austria, which he inherited in 1851, on August 24, 1883. He left no issue, and his claim descended upon the Comte de Paris.

Chambre Ardente, in French history originally a room draped with black and lighted by many torches (whence the name), where state criminals of high position were tried. Afterwards the name came to be applied to "special commission" courts, instituted for the trial of particular offenders. Francis I. established such a court for the trial of Protestants in 1535. It lasted for twenty-five years. Another was instituted in 1680 to try suspected poisoners in consequence of the alarm aroused by the murders committed by the Marquise de Brinvilliers, and another in 1716, which was abolished in the next year, to try farmers of the revenue for alleged frauds.

Chameleon. [Chamæleon.]

Chamfer, in *Architecture*. (1) a slope or bevel, ordinarily produced by cutting away a corner so that the line produced by the cut makes obtuse angles with the sides formerly containing the right angle. (2) A rounded groove is sometimes called a "concave chamfer."

Chamfort, Nicolas, *littérateur*, was born in 1741 in Auvergne. His brilliant wit gained him an entrance to the highest literary circles in Paris. An intimate friend of Mirabeau, he zealously espoused the revolution, was secretary to the club of the Jacobins, and was foremost amongst the attacking party at the storming of the Bastille. As a writer of anecdotes, Chamfort has never been surpassed. His wit, however, cost him his life, for on account of some cutting innuendoes he offended the Jacobins, who threatened to have him arrested. To avoid this indignity he attempted suicide, and inflicted upon himself serious wounds from which he died after several days' suffering, April 13, 1791.

Chamier, Frederick, naval officer, novelist, and historian, was born in 1796, his father being a member of the council of Madras. He entered the royal navy in 1809, attended the expedition to Walcheren, cruised in the *Arethusa*, 38, on the coast of Africa, and served, both ashore and afloat, with considerable distinction against the Americans. In 1815 he was promoted to be lieutenant, and, proceeding to the West Indies in 1824, became in 1826 commander of the *Britomart* on that station. He returned home in 1828, and did not succeed in again obtaining employment. In 1856 he assumed the rank of retired captain, and in 1870 he died. His chief works of fiction are *The Life of a Sailor*, 1834; *Ben Brace*, 1835; *The Saucy Arethusa*, 1836; *Jack Adams*, 1838; and *Passion and Principle*, 1842. He also, in 1837, edited and continued James's *Naval History* and published *A Review of the French Revolution of 1848*. His novels have little merit, but being mainly founded upon facts which are themselves very interesting, have always been favourites. Captain Chamier married in 1832 Elizabeth, a grand-daughter of Sir John Soane, the distinguished architect, and founder of the Soane Museum.

Chamisso, Adelbert von, poet, was born in 1781 at the castle of Boncourt, in Champagne. His parents being obliged by the outbreak of the French Revolution to seek refuge in Berlin, he became in 1796 a page to the queen, and in 1798 entered the Prussian service, which, however, he left in 1806, as he would not fight against his native country. Subsequently he turned his attention to natural history, and in 1815 accompanied a Russian exploring expedition in a voyage round the world as naturalist. On his return he became curator of the Botanical Gardens of Berlin, being elected to the Academy of Science in 1835. Though he wrote several works on natural history and botany, it is on his poetry that his fame rests. His ballads and songs are

masterpieces, and still retain their popularity. His most widely known production, however, is *Peter Schlemihl*, the story of the shadowless man, which has been translated into nearly every European language. He died in 1838 at Berlin.

Chamkani, an Afghan people at the foot of the Snfed Koh ("White Mountains") between Tira and Kuram east and west; appear to be a branch of the Orakzais detached from the parent stem at a remote epoch; three khels, each with numerous subdivisions: Khani, Azi, Khoja.

Chamois (*Rupicapra tragus*), a gregarious goat-like antelope, the sole species of the genus, ranging over the mountain systems of Central and Southern Europe into Western Asia. It was formerly much more numerous, and is now chiefly confined in Europe to the Bavarian and Styrian Alps, though some small herds still exist in the Swiss Alps. The male stands about 24 inches at the shoulder, and the female is somewhat smaller. The coat in summer is brownish-yellow, with a dark dorsal stripe, which is lost in winter, owing to the hair on the body becoming darker. The head is yellowish, and the hue deepens from the muzzle upwards. Both sexes have horns; these are about seven inches long, black, and cylindrical, parallel for some distance, then curving sharply backwards at the tip, and at the base of each is a peculiar gland, the function of which is not known. The horns are sold as souvenirs of Alpine travel, and are often used as the heads of alpenstocks. The voice is a goat-like bleat, but the sentinel gives a shrill whistle to alarm the herd when danger is near. The female bears rarely more than one at a birth, in the spring; the old males are for the most part solitary. These animals are remarkably agile, and have a peculiar power of ascending and descending precipices; their senses are also developed to a high degree, so that chamois-hunting is a very difficult and dangerous pursuit. The flesh is highly esteemed, and the skin yields the original chamois, or *shammoy* leather, which, however, is now also made from the skin of other animals.

Chamomile, or CAMOMILE (*Anthemis nobilis*), one of the *Compositæ*, a native of Britain and southern Europe, largely cultivated in Surrey and on the Continent for medicinal purposes. Its leaves are downy and much divided, and under cultivation all the florets tend to become white and strap-shaped. It contains a tonic bitter principle and a pale blue aromatic essential oil, both these substances existing in larger quantities in the yellow central florets of the wild form. An infusion of the flower-heads is used as a stomachic.

Chamounix, CHAMONIX, or CHAMOUNI, a valley of France in the department of Upper Savoy, is celebrated for its picturesque scenery, and forms the upper basin of the Arve in the Pennine Alps, at an altitude of 3,425 feet above sea-level. Its length, running from N.E. to S.W., is about twelve miles, and breadth from one to six miles. On the N. side are Mont Brévent and the Aiguilles Rouges, and in the S. and E. Mont Blanc, whence glaciers descend into the valley; among them the Mer de Glace, the grandest glacier in the Alps. The name Chamounix is also borne by the village in the valley, which has now become so famous as a resort for tourists that upwards of 15,000 are yearly accommodated there, and in 1860 an English church was

CHAMOUNIX, WITH MONT BLANC.
(*From a photograph by Messrs. Frith and Co., Reigate.*)

opened. It is mainly upon these visitors that the inhabitants rely. At the village are stationed the best guides for Alpine climbing, and from it the most customary ascent of Mont Blanc is made.

Champa, a term applied collectively to numerous tribes in the upper valleys of Ladâkh and the neighbouring Tibetan province of Rupshu; are of Tibetan stock and speech, and differ little from the Ladâkhi proper, except that the chin is less receding and the mouth more expressive (*Fr. Drew*).

Champagne, a wine, which derived its name from the province of France where it is chiefly manufactured. White and red champagnes exist, and they are designated "sparkling" or "still," according to whether they effervesce or not on uncorking. The sparkling wines are the more common. The effervescence is due to the wine being bottled before the fermentation of the grape juice is complete. By the subsequent fermentation large quantities of carbonic acid gas are produced, which, by the produced pressure, liquefy, and on opening the bottles escape rapidly in gaseous form. The different varieties of champagne are due chiefly to difference in the soils, and to minutiæ in the mode of manufacture. Imitations of the genuine wine are largely manufactured by impregnating light wines with carbonic acid.

Champagne, an ancient town of France, of which Troyes was the capital, now forms the departments of Maine, Haute-Marne, Aube, and Ardennes, besides portions of Yonne, Aisne, Seine-et-Marne,

and Meuse. Chief among its towns besides the capital were Bar-sur-Aube, Laon, and Rheims.

Champarty, or CHAMPERTY, a species of maintenance of litigation. It consists in the purchasing or bargaining over a thing in dispute between rival parties, with the object of maintaining and taking part in the litigation. It is not champarty if the parties to such purchase have a common interest, and a moral interest, as that of a parent in a child, suffices. Nor is it champarty to simply mortgage the property in litigation, with the object of raising the necessary funds to carry it on. Champarty is a misdemeanor punishable by fine and imprisonment. In Scotland this offence has no existence, *i.e.* it is not punishable. [MAINTENANCE.]

Champignon, the French name for mushrooms in general, applied in England to the small fairy-ring mushroom, *Marasmius oreades*, common on dry pastures. It is of a dull fawn colour, drying white, and is excellent eating, whilst the allied *M. urens*, acridly poisonous, is distinguished by having narrower gills.

Champlain, LAKE, separates New York state from Vermont. Its surface, 9·3 feet above sea-level, is upwards of 100 miles in length, and from one at its S. end to fourteen miles, at its N. end, broad. Its surplus waters are discharged into the St. Lawrence by the Richelieu river. It is also connected by canal with the Hudson river. It is named after Samuel Champlain, who discovered it in 1609.

Champlain, SAMUEL DE, French naval officer and explorer, was born in 1567 at Brouage, in Saintonge. During the years 1604–7, having made his first voyage to Canada in 1603, he explored the coasts, and in 1608 he founded Quebec. In 1620 he was appointed governor of Canada, and was captured by the English in 1629. Released in 1632 he went back to Canada, where he died in 1635. He wrote an account of his voyages.

Champollion, JEAN FRANCOIS, scholar, was born in 1791 at Figeac, in the department of Lot. Early devoting himself to the study of Oriental languages, he, in 1816, became professor of history at the Lyceum of Grenoble. In 1824 he was sent by Charles X. on a scientific mission to Italy, and in 1826 was appointed director of the Egyptian museum at the Louvre. Two years later he went as the scientific head of an expedition to Egypt, and in 1831 a new chair of Egyptology was created for him in the Collège de France. In the following year, however, he died at Paris. His sagacity is seen in his interpretation of the Rosetta Stone (q.v.), whereby he was led to the discovery that the three systems of Egyptian writing—the hieratic, demotic, and hieroglyphic—were really one, and that the hieroglyphs represented not ideas but sounds. The results of his investigations were published at the public expense in 1824. Among his other works were *Grammaire Egyptienne*, *Dictionnaire Egyptien*, and *Monuments de l'Egypt et de la Nubie*. His unpublished MSS., which numbered upwards of 2,000 pages, were purchased by the Royal Library at Paris for 50,000 francs.

Champollion-Figeac, JEAN JACQUES, archæologist, brother of the preceding, who is distinguished by being called "the younger" usually, was born in 1778 at Figeac. He became librarian and Greek professor at Grenoble, whence in 1828 he removed to Paris as conservator of MSS. in the royal library there. From this post he went in 1848 to Fontainebleau as librarian to Louis Napoleon. He wrote a number of archæological and philological treatises, and died in 1867.

Chancel (Low Latin *cancelli*, lattice-work), the upper, usually the east end of the church, generally containing the altar or Lord's Table, and often somewhat higher than the rest of the building. In some old churches, however, it is slightly lower. It is usually allotted specially to the clergy and choir, and was held in early times to be specially sacred (as it now is by Roman Catholic and Anglican High Churchmen), and therefore was railed off, whence the name. During the Reformation there was much controversy as to whether service was to be said there or elsewhere in the church. The former practice gave great offence to many of the Reformers. A reading-desk was therefore often erected outside the chancel, and in some cases the Lord's Table was transferred to the body of the church. This latter usage, however, caused so much irreverence that Archbishop Laud ordered that the table should stand at the east end of the chancel, and be railed in—a practice which has been universal in England since the Restoration. The chancel is legally the rector's freehold, and he is bound to keep it in repair.

Chancellor. A chancellor is the principal judicial officer of a sovereign or other important dignitary, or of a diocese.

1. *The Lord High Chancellor* of Great Britain, on delivery into his custody of the Great Seal, becomes *ipso facto* the highest officer in the State, and takes precedence of every temporal peer. He is by virtue of his office a Privy Councillor and Prolocutor (*i.e.* Chairman) of the House of Lords by prescription. He appoints for the Crown all the magistrates of the country (the county magistrates being usually nominated by the Lord-Lieutenant of each county). In former times the Lord Chancellor was usually an ecclesiastic, few others being then conversant with writings, and he was keeper of the king's conscience, which title accrued to him as presiding over the Royal Chapel. He is also visitor (in right of the sovereign) of all hospitals and colleges of royal foundation and patron of all crown livings under the value of 20 marks in "the King's Books." At the present time he has 12 canonries and 650 livings in his gift. He is guardian of all infants, idiots, and lunatics, and has the general superintendence of all charitable uses in the kingdom. He was formerly the principal judge of the Court of Chancery and is now president of the Court of Appeal of the High Court of Justice, and of the Chancery Division of the High Court; all writs of summons (the commencement of actions) being

tested by him. He is also President of the House of Lords when sitting as a Law Court (*i.e.* a Court of Appeal). He must necessarily be a barrister, and has usually served as Attorney or Solicitor-General. He goes out of office with the government of which he is a member. He is, of course, in the Cabinet, and has charge of all legal measures brought forward by them. He also advises the sovereign as to appointment of queen's counsel (or calling "within the bar" as it is termed) of certain barristers from time to time.

2. *The Chancellor of the Exchequer* was formerly a judge of the Court of Exchequer sitting as a Court of Equity. His judicial functions were, however, put an end to by the Judicature Act (they having before then become practically obsolete). His political functions, which consist in the special care and superintendence of the revenue, remain. He also changes with the ministry of which he is a member.

3. *Chancellor of a Bishop or Diocese.* He sits for the Bishop in hearing and deciding ecclesiastical suits, etc. The office usually includes those of official principal and vicar-general. [ARCHES, COURT OF.]

4. *Chancellor of the Duchy and County Palatine of Lancaster* is nominally Judge of the Chancery Court of the County Palatine and of the Duchy Chamber Court. His duties, however, are mainly ministerial. The Vice-Chancellor performs the duties of the court.

Chancellor, RICHARD, seaman, having been brought up "by one Master Henry Sidney," Sir Philip Sidney's father, went in 1553 as captain of the *Bonaventure*, with Sir Hugh Willoughby's expedition, fitted out "for the search and discovery of the northern part of the world." The ships getting separated in a gale, Chancellor pushed into the White Sea, and thence travelled overland to the Russian court at Moscow, where he concluded a treaty which led to the opening up of trade with Russia, and the establishment of the Muscovy Company. In 1554 he returned to England, going back in the following year to Moscow. On his homeward voyage, however, his ship was wrecked, and Chancellor and the greater part of his crew perished.

Chancery. Prior to the passing of the Judicature Acts which now regulate legal proceedings, the Court of Chancery was a distinct court, its chief business being to hear and decide questions of equity as opposed to common law. It has now, by the above Acts, become the "Chancery Division of the High Court of Justice," and possesses the same jurisdiction and powers as the old Court of Chancery. The Court of Chancery was in matters of civil property always deemed the most important of any of the superior courts of justice, and it is said to have taken its name from the judge who presided over it, the Lord Chancellor.

A distinction between law and equity requiring them to be administered in different courts seems never to have obtained in any other country, and yet the difference of one from the other, when administered by the same tribunal, was perfectly familiar to the Romans, the *jus prætorium* or discretion of the prætor being distinct from the *leges* or standing laws, but the power of both centred in one and the same magistrate, who was equally authorised to pronounce the rule of law and to apply it to particular cases by the principles of equity. With us, too, the *Aula Regia*, which was the supreme court of judicature under the Conqueror, undoubtedly administered equal justice, according to the rules of both or either as the case might require, and when that tribunal was broken to pieces, the idea of a court of equity as distinguished from a court of law did not exist. Nor is it very clear in what manner or under what circumstances the two distinctive jurisdictions were first established in England, but it was probably the result of the *original writs* issued for the commencement of actions being of a very fixed and inflexible character, and owing to this there was a frequent failure of justice in the common law courts; and application for redress had to be made to the sovereign in person, who was wont to refer the matter to his Chancellor for him to decide as the circumstances (*i.e.* the equity) of the case might require, and apparently, in these early times, the chief judicial employment of the Chancellor was in devising new writs directed to the courts of common law, to give remedy in cases where none was before granted.

In Scotland the Chancery office is part of the General Register House at Edinburgh, and is under the control of a director, his rights and duties being somewhat similar to those exercised by the English Lord Chancellor.

Chancre. [SYPHILIS.]

Chanda, a town of the central provinces of India, and capital of a district of the same name, is surrounded by a wall $5\frac{1}{2}$ miles in circuit. The district, which is hilly, with fine forests of teak, covers an area of 9,700 square miles.

Chandausi, a town of the North-West Provinces of India, is in the Moradabad district.

Chandernagore, meaning "City of Sandalwood," a town of India, belonging to France, is situated on the Hoogly. It was founded in 1673, and for a while rivalled Calcutta, from which it is distant 22 miles. It was thrice captured by the English, being finally restored to the French in 1816.

Chandler, RICHARD, archæologist, was born in 1738 at Elson, Hampshire. After publishing his *Marmora Oxoniensia*, he travelled through Greece and Asia Minor with the help of the Dilettanti Society for the purpose of examining and describing the antiquities of these regions. The results were given in *Ionian Antiquities*, *Ancient Inscriptions*, *Travels in Asia Minor*, *Travels in Greece*, and *History of Ilium*. He died in 1810 at Tilehurst, Berkshire.

Chandos, an English family that traces its descent to a follower of William the Conqueror. A leading member was James Brydges, born 1673, who was created Duke of Chandos in 1719. Having held the office of paymaster of the forces abroad

from 1707 to 1712 he was enabled to build a palace at Canons, near Edgware, at a cost of £200,000. Here Handel lived for two years. On the duke's death the palace was pulled down. Later the title passed into the Grenville family, the representatives of which are the Dukes of Buckingham and Chandos.

Chandpur, a town of British India, North-West Provinces, is in the Bijnaur district.

Changarnier, NICOLAS ANNE THÉODULE, general, was born in 1793 at Autun. After serving in Algeria, he was appointed in 1848 provisional governor of that province, soon after, however, proceeding to Paris to take command of the National Guard. While opposing the Bonapartists in the Legislature he did not identify himself with the Orleanists or the Legitimists, and on the *coup d'état* of December, 1851, he went into exile. On the outbreak of the Franco-German war, however, he offered his services to Napoleon, and was shut up in Metz with Bazaine. After the war he entered the Assembly, and proved a valuable aid to Thiers in reorganising the army. He died in 1877 at Versailles.

Chang-Chow, (1) a city of China, in the province of Fokien, is about 30 miles S.W. from Amoy, which is its fort. It has silk manufactures. (2) A city in the province of Kiang-Soo, is upwards of 50 miles S.E. of Nanking.

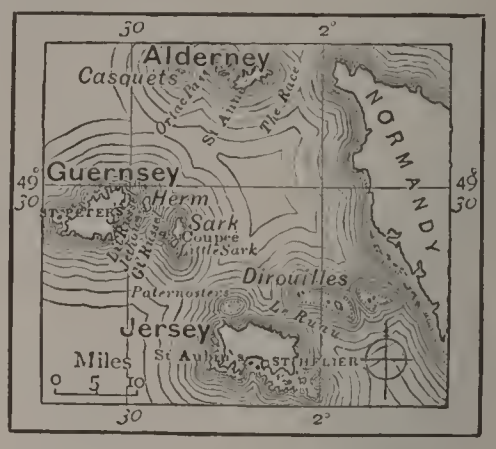
Changeling, in folk-lore a fairy child left by the fairies in exchange for an unbaptised human child stolen by them. Popularly the fairies were supposed to steal beautiful children and replace them by ugly ones; hence the name came to mean a simpleton.

Change-ringing, the ringing of a set of bells in every way so as to obtain all the permutations possible.

Chang-Sha, a city of China, capital of the province of Hoonan, is situated on the Heng-Kiang.

Channel, THE ENGLISH, the narrow strip of water that separates England from France, extends from the Straits of Dover to Land's End, Cornwall. At Dover it is only 21 miles wide, and in its widest part it is 155 miles. At its eastern boundary it joins the North Sea, and the Atlantic at its western, the English coast-line of the Channel being 390 miles long, and the French 570 miles. It has a gentle current from W. to E. In France it is called *La Manche*, or "the sleeve," from its shape.

Channel Islands, THE, a group of islands in the English Channel, lie off the north-west coast of France. They belong to Britain, being the only remnant of the Norman possessions once subject to the English crown. The principal ones are Alderney, Guernsey, Jersey, and Sark (q.v.). Though the inhabitants are British subjects, the official language is French. The prevailing industry is agriculture, the land being apportioned in small holdings, and the proprietors labouring upon it with their own hands. The climate is very agreeable, and so mild that vegetation is several weeks in advance of England. The cattle of these islands are famous, and are usually known by the name of Alderneys. The government is in the hands of bodies called "states," comprised of members



MAP OF THE CHANNEL ISLANDS.

appointed by the Crown and by the people. The islands are strongly fortified, and cover an area of 75 square miles.

Channel Tunnel, a proposed tunnel beneath the Straits of Dover, connecting Dover on the English side with Sangatte, near Calais, on the French side. The scheme was under discussion as far back as 1867, and has had the influential support of the late Prince Consort, Lord Beaconsfield, Mr. Gladstone, and others. Sir Edward Watkin, Bramwell, Low, Brady, Hawkshaw, and other engineers have given favourable opinions. The continual delays in the completion of the undertaking are mainly due to English hesitation for military reasons. The successful engineering of the tunnel seems assured, for the whole length of 23 miles could be cut along the bed of old grey chalk, impervious to water and well adapted for easy boring, which lies beneath the upper chalk bed of the Straits. A multitude of soundings have shown the continuity of this gray chalk without fault or erosion from one side to the other. Experimental cuttings at both ends have been made successfully for a mile or two under the sea, and the engineers report that very little water is encountered, this being fresh or brackish. The necessary pumping is, therefore, very slight. The tunnelling is rapid and easy, effected by the compressed-air boring machine, and no timber stays are required. Two single-line tunnels are proposed to begin with, one to ventilate the other. The line is to be worked by compressed-air engines. The inclusive estimated cost is £4,000,000.

Chansons de Gestes, the collective name of the old French epic poems dealing with the deeds (Lat. *gesta*) of various heroes, mostly belonging to the cycle of legends relating to Charles the Great. The *Chanson de Roland* is the best known.

Chant, in *Music*, a short melody sung to a psalm or canticle in places of worship. There are various kinds of chants, *e.g. Gregorian*, *Anglican*, *Parisian*, etc.; again, chants may be single, double, or even quadruple, though the latter are not common. In the *Anglican chant* the composition is divided into two parts, the first of three

and the second of four measures; each part ends with a cadence. The method of distributing the words to be sung is known as *pointing*.

Chantibun, a town of Siam, is situated on a river near the Gulf of Siam. It exports pepper, cardamoms, etc., and near it are mines of precious stones.

Chantilly, a town of France, in the department of Oise, is situated on the Nonette. It is celebrated for its silk lace, the manufacture of which, however, is now dwindling. It is also the centre of French horse-racing. It was here that Condé built his splendid château, which the mob pulled down at the revolution. Rebuilt by the Duc d'Aumale, it is now reckoned, with its grounds, park, and forest, with an area of over 6,000 acres, to be worth about £2,000,000.

Chantrey, Sir Francis Legatt, sculptor, was born in 1781 at Jordanthorpe, Derbyshire. The son of a carpenter, who died while Chantrey was only 12, leaving his widow in poor circumstances, he was in 1797 apprenticed for seven years to a Sheffield carver and gilder. In 1802 he was able to cancel his indentures and to work for himself as a portrait painter. In 1805, after a short time at the schools of the Royal Academy, London, he was commissioned to execute a bust of the Rev. J. Wilkinson for the parish church of Sheffield; other commissions followed, and in 1807, having married a lady of means, his struggle with poverty was ended. In 1808 he succeeded in the competition for the statue of George III. for the Guildhall, and henceforth the best work of his time fell to his lot. Becoming in 1816 an associate, he was elected a member of the Royal Academy two years later and knighted in 1835. His greatest work is the *Sleeping Children*, a statue group in Lichfield cathedral. Amongst the celebrities whose lineaments he chiseled were Watt, Wordsworth, Scott, Sir Joseph Banks, Pitt, Wellington, George IV., etc. In 1841 he died, bequeathing to the Royal Academy a capital sum worth £3,000 a year wherewith to buy the works of British artists. This is known as the "Chantrey Bequest," and many works have already been acquired with it. Chantrey excelled in his busts, his complete figures and equestrian statues exhibiting many defects.

Chantry (Fr. *chanter*, to sing), a small chapel where masses were daily to be sung for the soul of the founder or his relatives. They were endowed, and often attached to churches. They were disendowed and abolished by statute in the first year of Edward VI.'s reign.

Chanzy, Antoine Eugène Alfred (1823–1883), a French general, who, after serving for a year as a sailor, entered the school of St. Cyr in 1841, and two years afterwards went to Africa as lieutenant of Zouaves. After distinguishing himself there and in the Italian war, and as general of brigade when the French and Prussian war broke out, he was made general of division and took an active part in the war, and in 1870 Gambetta, who had a great opinion of him, gave him the command of the 2nd army of the Loire. At Le Mans in January, 1871, his army was almost destroyed by Prince Frederic Charles. In February he was elected member of the National Assembly, and in March was held prisoner by the insurgents. In 1872 Thiers made him a member of the committee of defence, and in 1873 Marshal MacMahon made him governor-general and commander-in-chief in Algiers. In 1879 he was ambassador to Russia, but in 1881 he resigned and was made commandant of the 6th corps d'armée. His death, a few days after that of Gambetta, was much regretted even in Germany, where he was much esteemed, and he received a public funeral. He wrote (1871) *The Second Army of the Loire.*

Chaos, in Greek mythology, the primordial undifferentiated matter which existed before the origin of the universe, and out of which it arose. Hesiod personified Chaos and called her the mother of Erebus (Darkness) and Nyx (Night). The word is commonly used as a synonym for confusion.

Chap-books (apparently akin to *chap*, cognate with *cheap*, denoting bartering), small books adapted for popular reading, usually consisting of wonderful tales, and hawked by *chapmen* or pedlars.

Chapel (probably from *cappa*, a cloak; originally the tent in which was kept the cloak of St. Martin, carried to war by the early French kings), strictly speaking any building in which Divine service is carried on, other than the parish church. Such buildings, dedicated to some special saint or to the Virgin Mary, are always attached to cathedrals, sometimes to parish churches; every college at Oxford and Cambridge has its chapel, as have some of the London City Companies and the Inns of Court, and some noblemen have domestic chapels. *Chapels of ease* in the Church of England are built for the accommodation of parishioners for whom the parish church is too small or too distant, and served by clergy from the parish church. They differ from the mission chapels of late years in being consecrated. Strictly speaking, Nonconformist and Roman Catholic places of public worship in England are called chapels.

Chapelain, Jean (1595–1674), a French poet born at Paris. His first work was the translation of a Spanish romance, *Guzman d'Alfarache.* An ode to Cardinal Richelieu brought him a pension and the reputation, both in his own opinion and that of others, of being a poet, and he had great influence in forming the academy. He considered himself the first poet of France, and projected an epic in twenty-four cantos, *The Maid of Orleans;* but on the publication of the first twelve in 1656 the feebleness of the work brought him into ridicule, and the remaining twelve still remain in MSS. at the National Library. He also wrote *Mélanges en Prose.*

Chapels Royal are certain of the domestic chapels attached to palaces of the English Crown —two, an Anglican and a Lutheran, at St. James's palace, one at Whitehall, and minor chapels at Kensington and Hampton Court palaces. The name is also applied to the chapel of the Savoy,

originally a palace chapel, which, however, is under the direct control of the Crown. The rest are governed by a dean, who is always the Bishop of London, and a sub-dean, and have other officials attached. Preachers in Lent are selected by the dean and approved by the Crown. The Boyle lectures (q.v.) were appointed to be delivered at the Chapel Royal, Whitehall. This latter was built by Inigo Jones for James I. as a banqueting hall, and converted into a chapel under George I. The Maundy alms (q.v.) were distributed there by the Sovereign. In October, 1890, this chapel was closed in conformity with the recommendation of the Chapels Royal Commission.

Chaplain, originally a clergyman who performed service in a chapel, now by custom applied to (1) the clergy specially retained by sheriffs and judges; (2) the examining chaplains of bishops, who act as their secretaries, and assist in examining candidates for orders; (3) the Queen's chaplains, forty-eight in number, thirty-six of whom are chaplains in ordinary, with a salary of £30 per annum each, and twelve are honorary chaplains and unsalaried; (4) the clergy retained as domestic chaplains by some English noblemen, nominally to read the service in the domestic chapels of their mansions; (5) the ministers of Anglican congregations abroad, including the clergy attached to British embassies and consulates; (6) the Anglican clergy, 160 in number, attached to the ecclesiastical establishment of the Government of India; (7) clergymen attached to hospitals, prisons, regiments, ships, or the House of Commons.

Chapman, George (1557–1634), English dramatic poet, contemporary and friend of Shakespeare and Ben Jonson. He went to Oxford at the age of 15, and is thought to have travelled afterwards in Germany. His first poem, *The Shadow of Night*, he published when 35, and four years afterwards he began the translation of *Homer's Iliad*, a work which, published at intervals, he finished in 1611. In 1616 appeared his edition of the *Iliad* and the *Odyssey* complete, and in 1624 *The Battle of the Frogs and Mice*, and the *Hymns and Epigrams*. His translation was approved by his contemporaries Jonson and Drayton, and has won the admiration in later days of Pope, Coleridge, Lamb, and Keats. He also translated Hesiod's *Works and Days*, and parts of the *Fifth Satire* of Juvenal. His earliest play, the *Blind Beggar of Alexandria*, was popular, and was printed in 1598, and one play, *Bussy d'Ambois*, was popular after the Restoration. Of his comedies, *All Fools*, *Monsieur d'Olive*, *The Gentleman Usher*, and *The Widow's Tears*, are distinguished by much humour and graceful poetry, and two plays upon Marshal Biron's history, though without dramatic merit, show lofty thought, and are good poetry. His *Cæsar and Pompey* also contains much that is good. Lamb was of opinion that Chapman of all Elizabethan dramatists came nearest to Shakespeare "in passages which are less purely dramatic." He is described by Anthony Wood as "a person of most reverend aspect, religious, and temperate," and appears to have been of haughty and austere habit. His friendship for Jonson and Shakespeare, supposing that such a friendship existed, does not appear to have prevented him from leaving a posthumous fragment of satire upon the former, or from having given cause for passionate protest from the latter, if Mr. Minto's conjecture be true—and there seems much ground for it—that some passages in Shakespeare's sonnets refer to Chapman. Chapman's complete works (3 volumes), with essay by Mr. Swinburne, appeared in 1873-75.

Chapone, Hester (1727–1801), an English authoress, daughter of Thomas Mulso, born in Northamptonshire. She had considerable accomplishments, and showed an early turn for literature, since in her tenth year she wrote a short romance. The best known of her works is *Letters on the Improvement of the Mind* (1772), but she also wrote in *The Rambler*, *The Adventurer*, and *The Gentleman's Magazine*.

Chapped Hands. This condition is caused by exposure of the skin of the hands to cold and moisture. It is particularly apt to occur in those whose occupation leads them to often have their hands in water, and who neglect to carefully dry the hands after each ablution. Attention to this latter particular will in itself, as a rule, put an end to the trouble. After applying the towel thoroughly, the hands should be held before the fire for a brief space, until every suspicion of moisture is removed. Various applications (the basis of most of which is glycerine) are said to expedite the cure.

Chappell, William (1808–1888), member of a London music publishing house, and author of a learned work upon ancient English music. In 1838 he began to publish a collection of *National English Airs*, and between 1855 and 1859 published *Popular Music of the Olden Time*, in 2 volumes, the first volume of which forms a complete volume of known English airs down to the time of Charles I., the second being a selection of the most important airs of later date. In 1874 he published the first volume of a *History of Music*. Mr. Chappell was an F.S.A., and had much to do with the foundation of the Musical Antiquarian Society and the Percy Society, for both of which he did work in editing and annotating.

Chapra, a town on the river Gogra in Bengal, capital of the Saran district, and close to the junction of the Gogra and the Ganges.

Chaptal, Jean Antoine (1756–1832), a French chemist and statesman. Born at Nogaret, Lozère, he studied chemistry at Montpellier, and obtained his doctor's degree in 1777, and went to Paris. In 1781 he was recalled to Montpellier to occupy a chair of chemistry there founded, and inheriting a fortune from an uncle he established chemical works. His labours brought on him the attention of Government, which gave him the cordon of St. Michael, and ennobled him as Comte de Chanteloup. The publication of a political pamphlet caused his arrest, but he was soon liberated. In 1798 the First Consul made him a councillor of state, and he was minister of the interior after Lucien Bonaparte. In this capacity

he did much for art and science, being among other things the introducer of the metrical system of weights and measures. He retired from office in 1804, but the Emperor gave him the Grand Cross of the Legion of Honour. After the downfall of Napoleon he retired into private life, but in 1816 Louis XVIII. nominated him a member of the Institute of Sciences.

Chapter, a body of ecclesiastical persons in a cathedral church, consisting of canons (formerly known as prebendaries), whereof the Dean is the head, all subordinate to the Bishop, to whom they act as a council of assistants in matters relating to the Church for the better ordering and disposing the things thereof. The Dean and Chapter formerly assisted the Bishop in the ruling and government of the diocese in the time of vacation. The members of the College of Arms, that is, the king's heralds and pursuivants, are said to hold a chapter when they confer on the business of their office, and in like manner chapters of the Order of the Garter are held.

Chapter House, the hall in which the chapter (q.v.) of a cathedral hold their meetings. Many of those belonging to English cathedrals are of great architectural importance and beauty.

Chara, a genus of plants of great botanical interest. They are aquatics occurring in fresh or brackish waters, especially when stagnant, in most parts of the world; and are often much encrusted with lime, so as to become brittle, and are hence known as stone-worts. Their stems, which rise from the bottom often through several feet of water, are very slender, consisting of *internodal cells*, often several inches long, surrounded by a circle of *cortical cells* and separated by *nodes*, from which spring the cortical cells, whorls of branches, and the sexual organs. The cortex is developed upwards and downwards from each node so as to meet that from the next node halfway along the internode. The cells contain numerous chlorophyll-grains which exhibit very clearly the rotation of the protoplasm. Growth takes place by the division of a large apical cell. The reproductive structures, both of which are red when mature, are very distinct from those of any other groups of plants. The antheridium or *globule* is a minute stalked sphere, enclosed by eight much-lobed cells, called *shields*. From the centre of each shield a cell, called *manubrium* or handle, proceeds towards the centre of the sphere, bearing a round cell or *capitulum* which in its turn bears six *secondary capitula*, each bearing four long *filaments*. Each filament, there being in all 192, consists of between 100 and 200 cells, each containing a spirally-coiled *antherozoid*, resembling those of mosses. The archegonium or *nucule* consists of a *central cell*, surrounded by five twisted cortical cells surmounted by five small cells forming the *teeth* of a *coronet*. After the antherozoids have made their way between these and fertilised the central cell, the whole nucule falls off and germinates like a spore, forming a *pro-embryo*, or cell-filament, from a bud on which a new plant originates. Nucules of *Chara* occur as fossils in Tertiary rocks, and are known from their markings as *gyrogonites*. *Chara* is now generally classified either near the mosses or among algæ.

Character (Greek *character*, a sign or engraved mark), a term applied in a variety of senses, among them (1) to the form of writing or printing, or the letters used in it; thus Russian is said to be written in the "Cyrillic character;" or to the signs employed in music; (2) to the group of qualities and habits that distinguish an individual or a nation; (3) to the parts in a play; (4) to eccentric or remarkable persons; (5) to the certificates as to past conduct and abilities, given to servants, etc., on leaving. In natural science it is a short definition expressing the distinguishing marks of a plant or animal. In its *legal* aspect it has several bearings. 1. In regard to a *criminal prosecution*, a defendant is allowed to call witnesses to speak generally to his character, though he is not allowed to prove particular actions bearing favourably on his character, unless they happen to stand in connection with some of the facts charged and proved against him. On the other hand the Crown seldom, in practice, seeks to put in evidence of generally bad character, and, though under certain circumstances, it may give proof of a previous conviction for crime, yet this must be within the restrictions imposed by the Legislature.

2. *As to Witnesses.* Evidence is admissible to show that a witness is unworthy of credit by reason of his general bad character, and if he is asked whether he has been convicted of felony or misdemeanor, and denies or refuses to answer, the opposite party may then prove the conviction.

3. *As to Servants.* If any person shall personate a master, and give a false character to a servant or assert falsely in writing that any servant has been hired for a period of time or in a station, or was discharged at any time, or had not been hired in any previous service, or if any person shall offer himself or herself as a servant pretending to have served or with a false certificate of character, or shall alter a certificate, or shall (contrary to truth) pretend not to have been in any previous service, the offenders in any of the above cases are liable under a statute passed in the 32nd year of the reign of George III., on conviction before two justices of the peace, to be fined £20, and in default to be imprisoned with hard labour for any time not more than three nor less than one month.

4. *As to parties to a civil action.* Evidence as to the character of a party to a judicial proceeding is not generally admissible, unless the nature of the proceeding is such as to put his or her character in issue.

5. *As to general representations* respecting the character or trade ability of a person, to whom credit is to be given on the faith thereof, these shall not render the party making them answerable for debts, which may have been contracted on the faith of them, unless they be in writing and signed by the party sought to be made liable thereon.

Charade (either from a French dialect-word meaning to chatter, or from a Spanish word for clown), a name applied (1) to a word given to be

guessed, the indication being given by some description of the meaning of each component syllable separately; (2) to a sort of improvised drama, the name of which is to be guessed from the action of the performers.

Charadriidæ, a large family of wading birds, containing the Plovers, Oyster-catchers, Sandpipers, etc.

Charadriomorphæ, in Huxley's classification a group of birds, equivalent to the family Charadriidæ (q.v.) with the Snipes and Bustards.

Charai (JARAI), a hill tribe of Indo-China on the left bank of the Sekong affluent of the Mekhong about the frontiers of Annam and Camboja; remarkable for their extremely fair complexion and Caucasic type in the midst of a Mongolic population. The language, which shows much analogy with Malay, possesses a peculiar character in which have been composed historical and other works. The Charais appear to be a fragment of the Cham nation [CHAM], who have lapsed into barbarism since the overthrow of the Cham power by the Annamese in the fifteenth century.

Charbon. [ANTHRAX.]

Charcoal. [CARBON.]

Charente, a French inland department, divided into five arrondissements, and having Angoulême as its capital. Generally level, save where the surface is broken by offshoots from the Limousin Mountains in the north, and by chalk-hills in the south, it is drained by the Charente, the Vienne, and the Dronne. Chestnut forests abound on the hills, and much wine is grown, which is for the most part distilled into brandy. Truffles also are plentiful. Felt, leather, paper, and pottery are the chief manufactures.

Charente-Inferieure, a maritime department of France, including the islands of Ré, Oleron, Aix, and Madame, and having to the E. Charente, to the S. the Gironde, and to the W. the Bay of Biscay. The surface is flat, and the department is traversed by many navigable rivers which are united by canals, and on the coast are many good harbours which carry on an extensive coasting trade. Brandy is manufactured from the wine of the district, and there are pilchard and oyster fisheries.

Charenton-le-Pont, a French town in the Seine department, on the bank of the Marne near its junction with the Seine. The bridge, which gives the town its name, is one of ten arches crossing the Marne, and connecting the town with Alfort, celebrated for its veterinary school. It is of great importance in the defence of the city, and is in the line of fortifications. There is a famous lunatic asylum at Charenton.

Charge, in *Electricity*. A body may be electrified in various ways; that is, it may be brought to a condition in which it exhibits certain electrical properties. [ELECTRIFICATION.] The body is then said to possess a *charge* of electricity, this expression to be understood as meaning the amount of electrification. It does not in itself imply that electricity is a form of matter, a subtle fluid permeating all matter and filling all free space, or a modification of the ether of the physicists, though certain of the properties of an electric charge may be in part explained by any one of these hypotheses. It states, however, that electricity may be measured. A charge may be *positive* or *negative*: a positive charge is similar to that produced on glass by rubbing it with silk; a negative charge is similar to that produced on sealing-wax by rubbing it with fur. Like charges repel each other, unlike charges attract. Electrical properties are only observable when one kind of electricity preponderates; and inasmuch as the normal state of things in a system of conductors is an exact neutralisation of the two kinds, the isolation of a charge of one kind in a body must involve the isolation of an equal amount of the opposite kind elsewhere. A charged, insulated, conducting sphere, for instance, placed in the middle of a room causes the accumulation of a charge of equal amount and of opposite kind on the inner surface of the walls of the room. This *induced* charge as it is called will remain *bound* so long as the insulated sphere retains its charge. And further, since unlike electricities attract each other, it follows that the charge on the insulated sphere must reside on its surface, a property common to all charged conductors. The insulating medium separating two charges has to oppose their tendency to unite or to separate still further, and is therefore subjected to strain. That it is thus strained has been made manifest in various ways. If the strain be too great the continuity of the insulator will be broken and the disposition of the charges will be changed. [DIELECTRIC.] The distribution on a body depends on its shape and on the position and shape of the neighbouring bodies. It is most intense in those regions on the surface of the body where the curvature is greatest. Hence the readiness of discharge at sharp points. An electrical charge admits of measurement, for the attractive or repulsive force exerted by two separate charges depends on their respective magnitudes and may be directly measured. The unit quantity is called the *coulomb*, and is such that if concentrated on a small conductor at a centimetre distance from an equally charged small conductor, a repulsive force of one dyne will tend to increase their distance apart.

Chariot. War chariots probably originated in Egypt (Exodus xiv.). They are seen in Egyptian and Assyrian paintings and were used by the Canaanites and the Hebrews. In the Homeric age in Greece the warrior was driven in a chariot—standing by the driver—along the hostile ranks, challenging the foe to personal combat. By 700 B.C. the chariot was only used for racing in Greece. It was on two wheels, open at the back, with a curved rim reaching about to the waist of the driver. Usually four horses were harnessed to it, abreast, the two inside ones yoked to the pole, the two outside more loosely attached. The races were on an oval course, the greatest skill being requisite

in turning at the end of a lap. Three-horse chariots are depicted on the frieze of the Parthenon ; two-horse were introduced into the races about B.C. 400. In Rome a victorious general rode in an ivory chariot at his triumph. Chariot races were introduced under the kings. Several courses (*circi*) existed under the later Republic. Usually there were four horses, sometimes two ; in one case at least seven, harnessed abreast. A Roman chariot is preserved in the Vatican, while the harnessing may be studied on the bronze horses of St. Mark in Venice. The ancient Britons had war-chariots, from the axles of which projected long scythes of iron.

Charity, PUBLIC. The systematic aid of the distressed was almost unknown before Christianity. Its modern growth has been doubtless greatly assisted by the substitution of free labourers for slaves, as the latter of necessity look solely to their masters for support. For various kinds of charitable institutions, *see* FOUNDLING HOSPITAL, NURSING MISSIONS, ORPHANAGES. Charity is far more developed in England than elsewhere, except in the United States. But Christian charity has too often assumed that the saying of its Founder, "The poor ye have always with you," refers to all time, and not mainly to small societies with fixed occupations and little mobility of labour, like that of Judæa in the Roman period. The wisest modern charity essentially aims at the promotion of self-help. Charities, public or otherwise, have always been much favoured by the law, for "no time," as Lord Coke observes, "was so barbarous as to abolish learning, or so uncharitable as to prohibit relieving the poor." Wherefore, when by a statute of Henry VIII. c. 10 gifts to *superstitious* uses were made void, gifts for *charitable* purposes were held not to fall within the provisions of that statute. By a statute of the 39th year of Queen Elizabeth's reign (made perpetual by a later statute) any person was enabled by a deed enrolled in Chancery to found a hospital and to give it a corporate existence, with capacity to take and purchase goods and chattels, lands and tenements, and this without the king's licence in mortmain, and subject only to these conditions that the lands were *freehold* in fee simple of the clear annual value of £10, and not exceeding £200 in annual value. By the above and later statutes the interposition of the legislature had been uniformly favourable to charities. Abuses, however, gradually found their way, particularly that attending the power of disposing of lands by will or making them over at the approach of death for purposes of this description, and therefore by a statute passed in the 9th year of the reign of George II. c. 36 (after reciting that many large and improvident alienations of land to charitable uses had of late been made by dying persons), it was enacted that no lands or hereditaments, or money to be laid out in the purchase thereof, should be given or conveyed, or otherwise charged or incumbered in trust for, or for the benefit of any such uses, unless by such conveyance *inter vivos*, and under such conditions as the Act specified. This Act does not apply to dispositions of mere personal estate when not directed to be laid out in land, and such dispositions by will or otherwise may consequently be made without restraint to charitable uses.

Abuses in charities are now remedied by the Attorney-General, who, in his official capacity, institutes proceedings in Chancery at the relation of some informant (called the Relator) to have the charity established, or to have the charity funds duly administered; and it is not necessary that the relators should be the persons principally interested, for any persons (though the most remote of those falling within the scope of the charity) may act in that capacity. The registration of charitable donations is provided for by a statute passed in the 52nd year of the reign of George III. (c. 102), and such registration is now part of the business which by the Local Government Act, 1888, has been transferred to the County Councils established by that Act, and the Clerk of the Peace is made the Clerk of such Council. The protection of charitable endowments is also otherwise secured by a series of statutes passed previously to the present reign, and known as the "Charitable Trusts Acts."

And with regard to all charities it is a rule that the intention of the donor, so far as it is practicable and legal, shall be strictly observed, the law not permitting it to be varied without necessity, even by consent of the heirs. But where such intention is incapable of being literally acted upon, or its literal performance would be unreasonable, a decree will be made for its execution *cy-près*, that is in some method conformable to the general object, and adhering as closely as possible to the specific design of the donor. For example, where a sum of money was bequeathed to trustees to be distributed among the inhabitants of several specified parishes in money, provision, physic, or clothes as the trustees should think fit, and the fund ultimately became too large to be suitably confined to those objects, the Court directed it to be applied to the further objects of instructing and apprenticing the children of those parishes to benefit which the charity was designed. On a somewhat similar principle it was enacted by a statute passed in the present reign, known as "Lord Lyndhurst's Act," otherwise the "Dissenters' Chapel Act," that as to meeting-houses for dissenters where no religious doctrines or modes of worship had been prescribed by the Deed or Instrument of Trust, the usage of the congregation for 25 years should be taken as conclusive evidence of the doctrines and worship which might be properly observed therein.

Lastly, though by Roman law a legacy to pious or charitable uses was entitled to a preference over other bequests in a will, it is not so by our law, which directs that in the case of a deficiency of assets the charitable legacies shall abate in proportion to the others, but the testator may of course himself give the charitable legacies a priority over all other legacies.

Charity Organisation, the effort by combined action and experienced direction to prevent misplaced, useless, or harmful charity. There are now over ninety societies working to this end

in Great Britain, and in America and Germany the movement has considerably developed. The "London Society for Organising Charitable Relief and Repressing Mendicity" is a federation of forty district committees, one or more in each poor-law division, and a central council. The committees investigate individually all cases referred to them; they supplement the poor-law, act as dispensers for special charities and private benefactors, procure pensions, employment, medical treatment, surgical appliances, entry to convalescent homes, hospitals, and almshouses, and give aid towards emigration; they also make loans and grants from their own funds; and they are generally representative of local philanthropy. Of 21,402 applicants in 1889–90, 9,823 were assisted, 9,211 not assisted; and the rest withdrew. Of the money spent, £4,431 came from other agencies, £3,738 from the Society's funds, and rather less from individual donors. The Council (Mr. C. S. Loch, Hon. Sec., 15, Buckingham Street, W.C.) chiefly plans the wider application of the Society's principles and the suppression of imposture. It has also specially considered such subjects as exceptional distress, the management of medical charities, free meals for school children, poor-law out-relief, General Booth's scheme, etc. On these and other matters it has published papers; and it issues periodically the *Charity Organisation Review* and the *Charities Register and Digest.*

Charivari, the French equivalent for the "rough music" with which unpopular persons are sometimes saluted in France, as in our rural districts. It was not uncommon on the Continent of Europe during the Middle Ages, and was specially directed against those suspected of various matrimonial offences, in particular widowers or widows who married again, or wives who beat their husbands. The practice occasionally provoked interference by the Government, especially in France. The name was adopted by the prototype of *Punch*, the satirical paper *Charivari* of Paris, first published December 2, 1832. Felix Pyat and Lucien Reybaud were amongst the earlier members of the editorial staff. The paper had to suffer twenty prosecutions during the reign of Louis Philippe.

Charlemagne (742–814), or KARL THE GREAT, the Napoleon of the Dark Ages, was the son of Pepin le Bref, and grandson of Charles Martel. In 768 he succeeded his father jointly with his brother Carloman in the kingdom of the Franks, and when at Carloman's death in 771 he became sole ruler, he wielded sway over a vast kingdom, and had great influence, besides being looked on as the bulwark of Christendom against the Saracens and the heathen of the North, and the protector of the Pope against the Lombards and the Greek empire. It was in 772 that he began the great work of his life—the conquest of the Saxons. These formidable enemies were the only remaining champions of the old Germanic power against the Franks, of the ancient religion of Odin against the new and aggressive Christianity. After a severe struggle, in which Charlemagne took their stronghold of Ehresburg, and overthrew their idol Irminsul, the Saxons were forced to submit for the time. The king then turned his attention to the Lombards, whose king had invaded the Papal dominions owing to the refusal of the Pope to aid him against Charlemagne, whose wife, the Lombard king's daughter, had been divorced for barrenness. The result of this campaign was the subjugation of Lombardy, and the placing of the Iron Crown upon Charlemagne's head. A revolt of the Saxons brought the conqueror once more down upon them, and after two more campaigns he forced them in 777 to do him homage, and accept almost universal baptism. An invitation from Spain to intervene in the wars of the Arabs and Moors led to an expedition into Spain, which had the solid result of adding the territory as far as the Ebro to his dominions, and has proved a lasting theme to romancers and minstrels since. The king's rearguard was attacked in the pass of Roncesvalles, and Roland, with many other of the Frankish chivalry, lost his life. In 785 the Saxons—in spite of the severe lesson Charlemagne had given them in 782, when he massacred 4,500 prisoners—made what was almost a last despairing effort, only to be again crushed, and to see themselves deported into other provinces of the empire. In connection with this deportation it may not be uninteresting to point out the fact that in the Grand Duchy of Luxemburg there are in daily use a very considerable number of words which are almost absolutely identical with the English words for the same ideas, and it is said by tradition that the inhabitants of this region are descended from the Saxons transported thither by Charlemagne. In 788 Charlemagne added Bavaria to his kingdom, and in 791 his campaigns against the Avars, a Mongol race inhabiting what is now Hungary, ended in his becoming possessed of Pannonia. Many fights he had with the Wends and Danes and Czechs; but they all ended in the same way, and his sway extended over almost all Central Europe. In 800 he reached what seemed the height of ambition when he became Roman Emperor; but his views were even yet bolder, for he had conceived the idea of uniting the Eastern and Western Empires by a marriage with the Greek Empress Irene, a plan which was brought to naught by her fall. In 801 Charlemagne received an embassy from the Caliph Haroun Al Raschid, his Eastern counterpart.

That Charlemagne was something more than a conqueror is shown by his measures for organising and civilising his dominions. His establishment of counts of the marches, his sending representatives to ensure uniformity of system in different parts of his empire, his two yearly councils, one military, the other civil, his plan of uniting the Rhine and the Danube by a canal, all show great political foresight, and if his empire fell to pieces after his death, it was because the age was not yet ripe for it. Not only did Charlemagne encourage and court the acquaintance of learned men, he was also of no mean literary pretension himself, as some of his works show. Much of his success seems to

have been owing in some measure to his intense vitality and vigorous constitution, added to great intellectual power. "I conquered the world," he is made to say in Owen Meredith's *Legend of the Rhine*, "because God gave me a gizzard;" and there may be a germ of truth in this.

Charleroi, an important manufacturing town of Belgium, in the province of Hainault, on the Sambre, and about 33 miles S.E. of Brussels. It was formerly fortified, and has at divers times been a place of great military importance, notably in 1815 when Napoleon occupied it a few days before the battle of Waterloo. Being in the coal district it has great ironworks, nailworks, and smelting furnaces, and there is much manufacture of glass and hardware.

Charles, Karl Ludwig Johann (1771–1847), Archduke of Austria, third son of Leopold II. In 1796 he commanded the Austrian army on the Rhine, and defeated the French general Moreau at Rastadt. He also defeated Jourdain, drove the French across the Rhine, and took Kehl. In 1799 he again headed the army of the Rhine and again defeated Jourdain and held his own against Massena. In 1800 bad health compelled his retirement, and he was made governor of Bohemia, where he raised another army and stopped Moreau, till the conclusion of an armistice. In 1805 he commanded an army in Italy against Massena, was defeated at the battle of Caldiero, but made a good retreat into Croatia. In 1809 he won the battle of Aspern, but Napoleon checked him at Wagram, and pushed him back and back. Shortly afterwards an armistice was concluded, and the Archduke disappears from public life save for a moment after Napoleon's return from Elba.

Charles I. (1600–1649), King of England, son of James I., succeeded his father as King of Great Britain and Ireland in 1625, and married three months after his accession the French princess, Henrietta Maria, thus at the outset of his reign giving offence to his subjects by an unpopular marriage, and beginning that series of misunderstandings and disputes which culminated in his death upon the scaffold. It would be impossible, in a limited space, to give more than a brief outline of the king's life, since a full history of it would entail an examination of one of the most important and stirring periods of English history, much of which will naturally be treated under separate heads, to which the reader is referred. After the death of Buckingham (q.v.), Charles was much under the influence of his wife, which, with that of Strafford (q.v.), the author of the "Thorough" policy, and that of Laud (q.v.), the High Church archbishop and Puritan-hater, had much to do with shaping Charles's policy and conduct during the most eventful part of his life. In 1628 the Parliament presented the *Petition of Right*, and having dissolved this parliament Charles did not summon another for eleven years. In 1640, however, the failure of his attempt to force a liturgy upon Scotland made it necessary to summon Parliament once more, and the Parliament, refusing to vote money before the redress of grievances, was at once dissolved. It is called the "Short" Parliament. In the same year the "Long" Parliament was summoned, and under the leadership of Pym at once proceeded to most vigorous measures. Its first movements were to impeach Strafford, and to vote its own dissolution impossible without its own consent. Charles had the incredible weakness to sacrifice Strafford, and to confirm the Bill making the Long Parliament immortal. In 1641 the Parliament presented the Grand Remonstrance, and in 1642 the king took the step of going down to the House and demanding the surrender of five members, a proceeding which Parliament and the country at large looked upon as a breach of privilege. From this point events marched quickly. To nineteen propositions made in June, 1642, which would have greatly modified the constitution, the answer was open war. With fluctuating success the Civil war went on till the battle of Naseby, and the revelation of the king's duplicity which followed, led to the king's flight to Scotland in 1646. The next year his faithful Scots delivered him up to his foes, who, however, were now differently composed from heretofore. The army was now in the ascendant, and could dictate terms to the Parliament. Cromwell and Ireton, on behalf of the army, tried to make terms with the king, but the latter would not listen, and fled to the Isle of Wight from Hampton Court, where he had been kept in a kind of honourable captivity. Again Parliament tried to make terms, but the army took matters into its own hands and confined the king in Hurst Castle, from which they brought him to London. The Commons then, without the concurrence of the House of Lords, and in a House "purged" of those members who did not approve of the proceedings, constituted a committee as a High Court of Justice under Bradshaw as president; and in January, 1649, after a four days' trial, sentenced the king to death as a tyrant and traitor to his country. This sentence was carried into effect upon the 30th of January.

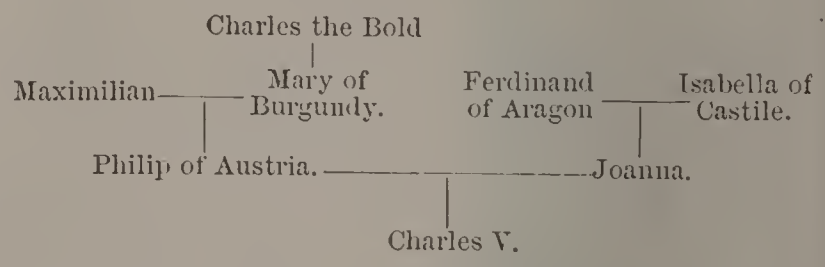
Charles II. (1630–1685), King of England, was born at St. James's Palace. He was present in 1642 at the battle of Edgehill, and in 1646 succeeded in escaping to France. After remaining in Paris for two years he proceeded to Holland, and in 1648 he made a futile expedition to the Thames. It was in this year that he offered to the Parliament *carte blanche*, provided they would only spare his father's life. He accepted the invitation of the Scots in 1650, and was crowned at Scone in 1651. Wearied with the Puritanism of the Scots, and hoping to make good his footing in England, he left Scotland in August, 1651, with 10,000 men upon the campaign that ended so disastrously at Worcester on the 3rd of September. The next few weeks of his life were exciting enough, till upon the 15th of October he was able to escape from England by embarking from Shoreham for France. He spent three years in France, three years in Cologne, and three in the Low Countries, and then in 1660, in response to the invitation of General Monk and a majority of the nation, he arrived to take up his

kingdom on the 26th of May. Scott gives a graphic account in *Woodstock* of his entry into London. His reign was not a very bright one for England, though it is hardly fair to charge its faults solely to the king. To exile him, and drive him from place to place, and then to expect him to come back when the nation pleased to change its temper, and take his place meekly, and live as decorously as though he had been comfortably installed at St. James's, instead of leading a shifty life upon the Continent, was expecting too much from human nature. After the Convention had made liberal terms with the king, the so-called Cavalier Parliament was called, which sat from 1661 to 1679, and saw many political changes. So long as Clarendon had influence things went comparatively smoothly, but after him troubles soon began. The acceptance of a subsidy from France in 1661, and the sale of Dunkirk in 1662, raised grave fears in the hearts of many, and when in 1667 the Dutch under De Ruyter sailed into the Medway, and burnt Chatham dockyards, the national disgrace seemed complete. In 1670 a secret treaty with France, and the acceptance by the king of a pension from Louis XIV., and the promise, with which he was credited, to endeavour to bring about the conversion of England, gave dire offence. With a view to counteracting French and Catholic influence the country almost forced the king to consent to the marriage of his niece Mary to the Prince of Orange. The year 1679 is memorable in English history as having seen the passing of the Habeas Corpus Act, which is looked on as the complement of the Great Charter, and as an almost equally valuable bulwark of English liberty. Whether the indulgence which was granted in the early part of the king's reign was intended to make things easy for the Catholics especially, or from a desire for general tolerance, is of little moment, since in any case it had the effect of making the king's government unpopular, and led to the sharp division of politicians into the court and country parties which existed in the latter part of the reign. The dread of the Catholic succession expressed itself in the readiness with which the country allowed itself to be gulled into a belief in the existence of a "Popish Plot," and was also the governing motive of the abortive "Rye House Plot." The Great Plague and the Great Fire of London are events which make Charles II.'s reign memorable.

The king's marriage with Catherine of Braganza almost escapes notice, since there were no children born of the marriage, and it is chiefly notable as leading to the founding of our Indian Empire, since Bombay was part of Catherine's marriage portion.

Of the king's character and actions it is difficult to judge fairly. Every allowance ought to be made, on account of the wandering life of his early years, and much of what was called his unpatriotic truckling to France may have been a feeling of gratitude towards those who had befriended him in adversity. That he was shrewd and clever we know, and that he treated most things with a cynical and careless good nature is established, but to put him down as utterly selfish seems hardly warranted by facts. He tried hard to save his father, he resented the attempt to implicate his neglected wife in the supposed Popish Plot, and he risked much to prevent his brother's exclusion from the succession. It has been said that he was ungrateful to the Cavaliers who had made great sacrifices for the Crown, but it would have been impossible to satisfy all their expectations. Perhaps the gravest blot on his character is the fact of his allowing people to die for taking part in a plot which he did not believe to exist. On the whole, it is impossible not to like if one cannot respect "the Merry Monarch," who was "Old Rowley" to his intimates, was generous to his mistresses and their offspring, and who apologised to his courtiers for being "such an unconscionable time dying," and with almost his last breath bade them "not let poor Nelly starve." He at least was no hypocrite, and that in itself was a virtue at that epoch. Of his mistresses the most known are Nell Gwynn, who was a woman of many good qualities; Lucy Walters, the mother of the Duke of Monmouth; and Louise de Querouaille, whose house is still to be seen in Lincoln's Inn Fields decorated with the Rose and the Fleur de Lys. Possibly as good an idea of Charles's personality as can be formed is to be got from Scott's *Woodstock* and *Peveril of the Peak*.

Charles V. (1500–1558), Emperor, and one of the most prominent figures of the 16th century. He was born at Ghent.



Thus he inherited immense possessions—the Netherlands, Spain with her vast and constantly increasing colonies, and Austria. Until 1517 Charles lived in the Netherlands, where he had for one of his tutors the priest who afterwards became Pope Adrian VI. He was elected emperor in 1519 on the death of his grandfather Maximilian, and was crowned at Aix. But it was a thorny crown that he inherited. The Turks under Soliman the Magnificent threatened his eastern boundaries, Francis I. of France was a bitter foe, he had to face a revolt in Spain, and the stubborn Flemings of the Low Countries gave him constant trouble. Meantime he could never be sure of the Pope's friendship, nor of that of Henry VIII. of England. Another trouble of his reign was the growth of Protestantism, which had been taken up warmly by some of the German princes. Policy, therefore, inclined the king to make terms with it if possible. It was with this view that the Diet of Worms was held (1521), in which Charles was more or less gracious towards a movement he was far from approving. And a war with Francis I., which lasted for eight years, until 1544, made him less inclined to take

strong measures against the Protestants. In the same manner when the Diet of Augsburg was held (1530), the Turks were fully occupying the king's attention. In the same year an impossible compromise was attempted by the convocation of a Council, which at last met at Trent in 1545.

In 1546, the French war having ceased, Charles turned his attention to the Protestant princes and subdued them; but a few years later Maurice of Saxony, having beaten the French and the Turks turned the tables upon Charles. The French seized Metz—which they have held three centuries till the last Franco-German war—and the emperor's plans generally were abortive. He had been betrothed to Mary of England, but his son Philip married her in his place. In this case there was disappointment. The much-desired heir who should unite the Spanish and English crowns did not come, his own wife whom he had greatly loved had died many years before, his subjects troubled him, the hateful new religion made head, and he was wearied of life. He resolved upon abdication of his power, and retirement into private life. In 1554 he made over Naples to his son Philip, in 1555 he resigned the Netherlands to the Prince of Orange, and in 1556 he divested himself of the crown of Spain, and finally resigned the empire in 1558. He retired to a convent in Estremadura, near to which he built a house and occupied himself in congenial pursuits. Although no longer taking an active part in politics he kept a keen watch upon events, and often intervened with advice upon the affairs of the empire. One of his latest acts was to bequeath to his son a policy of intolerance, that policy which cost him his Low Country possessions.

Charles VII., of France (1403–1461), was the third son of Charles VI., and succeeded his father in 1422, being born in the stormy time that followed upon the English victory of Agincourt, which led to the acknowledgment of the claims of Henry V. of England, and to the marriage to him of Charles VI.'s daughter Catherine. Although King Charles VII. had no great qualities, his reign was memorable, since it restored France from subjection to independence, and produced such characters as Dunois, La Hire, and Joan of Arc. The Duke of Bedford in 1427 laid siege to Orleans, and in 1429 was forced by Joan of Arc to raise the siege. In 1435 a treaty between France and Burgundy marked the beginning of the end of the English rule, and in 1453 the death of Talbot at Castillon virtually ended the long war. After this Charles VI. was enabled to give his attention to once more consolidating the country, and in this work he is said to have been aided by his mistress, the noted Agnes Sorel, after whose death he did little that was worthy of note.

Charles IX., of France (1550–1574), son of Henry II. and Catherine de Medici, succeeded his brother Francis II. at the age of 10, his mother Catherine being constituted regent. His reign is noted as witnessing the struggle between the Huguenots under Condé and the Admiral Coligny, and the Catholics headed by Catherine and the Duke of Guise. The young king seems to have been in favour of toleration; he married his sister to the Huguenot King of Navarre, and welcomed Coligny at Court, and was indignant at the attempt to assassinate him, and yet in 1572 when the massacre of St. Bartholomew took place the king was aiding and abetting, even firing upon the fugitives with his own hand. It is doubtful whether he did this owing to his mother's influence and persuasion, or whether he had been induced to believe that the Huguenots had formed a plot against his life.

Charles X., of France (1757–1830), third son of the Dauphin of France, and grandson of Louis XV. He married Maria Theresa of Savoy, and, as the Comte d'Artois, made some half-hearted attempts to make good the Royalist claims. In 1814 he made his appearance in France as lieutenant-general of the kingdom and leader of the Royalist party. When Louis XVIII. died in 1824, the count succeeded as Charles X. He made it his plan to carry out the old despotic ideas of the monarchy, and succeeded in provoking a revolution in 1830, which resulted in his deposition and the election of Louis Philippe d'Orleans as king.

Charles X., of Sweden (1622–1660), succeeded to the throne in 1654. He was very warlike, and in the second year of his reign he made war upon and subdued Poland. He then made himself Lord of Prussia, and again attacked and subdued Poland. His next attack was upon Denmark, in the course of which he crossed the Great and Little Belt upon the ice. As the result of the war he obtained the freedom of Swedish ships from paying toll on passing through the Sound (1658). He proposed to England and Holland to join in an attack upon Denmark and to share it with him. The States General and Cromwell both refused. He then invaded it alone in 1659, but was defeated, and the next year he died.

Charles XII., of Sweden (1682–1718), succeeded his father at the age of 15. As he was so young his neighbours, who had not forgotten the aggressions of his grandfather, Charles X., thought that their turn had come, and Frederick of Denmark, Augustus of Poland, and the Czar Peter of Russia, all resolved to fall upon him. The Danes began, but an Anglo-Dutch squadron aided Charles by threatening Copenhagen, and Denmark was obliged to abandon her intention. In 1700 Charles defeated the Russians at Narva; he then proceeded to dethrone the king of Poland; and in 1708 he made a sudden incursion into Russia, and nearly succeeded in capturing Czar Peter, drove the Russians before him, and had the way open to Moscow, when he all at once turned south towards the Ukraine in order to effect a junction with some forces which the Cossack Mazeppa had promised to bring to his aid. Mazeppa, however, was not able to keep his promise; the Czar cut off Charles's reinforcements from Sweden, beat him at Pultowa (1709), and the king was obliged to flee to Turkish territory at Bender. Russian agents—apparently then as ubiquitous as now—caused him after a time to be violently expelled from Turkey, or rather to escape to save his life, and in 1714 he was back in his own country. In 1716 he attacked Norway, and then formed a scheme of making peace with the Czar, taking

Norway, and restoring the Stuarts to the throne of England. In 1718 he again attacked Norway, and was killed at the siege of Friedrichshall by a musket-shot while recklessly exposing himself outside the entrenchments. There were rumours that he died by a shot from his own side, and accusations were brought against some of his officers, but could not be proved. A surgical examination of the skull at a later period gave countenance to this view owing to the ignorance of the doctors, who thought that the hole made by the exit of the bullet was caused by its entry. A recent examination has proved that the bullet came from the direction of the city, and that it was fired from a higher level than that occupied by the king. This enthusiastic madman was a thorough soldier, simple in dress and habits, shared all the privations of his men, and was as much beloved by them as Napoleon I. was by his soldiers. The *Life of Charles XII.* by Voltaire, though not accurate in all particulars, is well written and is of great interest.

Charles XIV., of Sweden and Norway (1764–1844), was by birth a Frenchman (Jean Baptiste Jules Bernadotte), the son of a lawyer at Pau. In 1780 he became a soldier, and by 1804 he had worked his way up to the rank of Marshal of France, and had greatly distinguished himself under Napoleon in Italy and in Germany. But eventually Napoleon became jealous of his great general, and Bernadotte left the army and returned to Paris. In 1810 he was elected Crown Prince of Sweden and heir to the throne. He took part with the Allies against Napoleon, but an unaccountable delay, which prevented him from doing anything of importance, is supposed to have arisen from his unwillingness to attack France. In 1818 he succeeded to the throne, and did much to further the well-being of the country which had adopted him.

Charles Albert, King of Sardinia (1798–1849), son of Charles Emmanuel of Savoy. He succeeded to Savoy in 1800, and in 1817 he married the daughter of the Archduke Ferdinand of Tuscany. At the revolution in Piedmont in 1821 Victor Emmanuel abdicated, and Charles Albert was regent until the arrival of Charles Felix. The latter, however, did not approve of his measures and annulled many of them. In 1831 Charles Felix died, and Charles Albert became king, and in him the hopes of Italian freedom were centred. But he was too prudent for the hot heads of young Italy, and Mazzini disapproved of him. In 1848 the war broke out against Austria, and Charles lost ground. In the battle of Novara against Radetzky (1849) he was defeated, and abdicated the throne. He retired to Portugal, and died there broken-hearted.

Charles Edward. [STUART.]

Charles Martel (about 688–741), natural son of Pepin d'Heristal, Duke of Austrasia and Mayor of the Palace to the Merovingian kings of France, was chosen by the Austrasians as their duke in spite of Pepin's disposal of the mayoralty to a grandson. He passed his life in fighting, subduing the Neustrians and making himself mayor of the palace, forcing the Duke of Aquitaine to do homage to the French crown, driving back the German tribes, and forcing the Frisians to embrace Christianity, and finally, in 737, not taking the trouble to nominate another king upon the last king's death, he became real King of France, without, however, taking the title. But he is most noted for the victory he won in 732 at Tours over the Saracens, a victory which gained for him the name "Martel"—the hammer, and by checking the northward march of the Saracens probably changed the whole future history of Europe. At his death he divided his dominions between his two sons, Pepin and Carloman, and at the death of the latter, Pepin succeeded to the whole, and took the title of king, which power and title he handed on to Charlemagne (q.v.).

Charles the Bold (1433–1477) was the son of Philip the Good, Duke of Burgundy. While still Count of Charolais, he was the great enemy of Louis XI. of France, and with the aid of the Duke of Brittany and others, he defeated Louis at Montlhéry. He succeeded to the dukedom in 1467, and made it his ambition to make his duchy independent of France. Louis proposed a conference, and imprudently put himself in Charles's power at Peronne, just at the moment that the Liégois revolted and killed their prince-bishop. Charles, who thought that the insurrection was fomented by French agents, a view whose truth or falsehood has never been clearly settled, was greatly enraged, and for a time Louis's life was in danger. Finally the duke insisted on the king's presence at the chastisement which he inflicted upon Liège, and forced from him some important concessions. This story is well told by Scott in *Quentin Durward*, the facts—with which, however, he takes some liberties—being based upon the statements of Philippe de Commines.

In 1475 Charles took Lorraine, and in the next year attacked the Swiss, who proved a more formidable enemy than he expected. He stormed Granson, but was soon after defeated in the vicinity, and in the same year he received another defeat at Morat. In 1477 occurred his last battle, that of Nancy, caused by an attempt of the Duke of Lorraine to get back his territory. After the battle Charles's body was found dead in a ditch. Charles was a good soldier, and had good intentions in the method of government, but he was liable to fits of mad anger, in which no considerations of prudence or justice restrained him, and he often gave dire offence by his violence.

Charles d'Orleans (1391–1465) was the grandson of Charles V. of France, and the father of Louis XII. Being made prisoner at Agincourt, he was carried to England, where he passed twenty-five years in captivity before the payment of his ransom set him free. He set up his court at Blois, where he occupied himself with poetry, and he has been considered by some as the father of French lyric poetry. His favourite composition was the rondel, and his subjects Love and Spring.

Charleston, a port of the United States, capital of the county of the same name, and the

largest and chief commercial port of South Carolina. It is situate upon a tongue of land between the rivers Ashley and Cooper, which here form a spacious harbour of seven miles by about two, and land-locked on all sides except the entrance, which admits vessels of under 18 feet draught. The harbour is defended by Fort Sumter —of Civil war renown—and Fort Moultrie, and also has forts inside. The town, which has a water front of nine miles, is well laid out, and has two main avenues with cross-streets from river to river, and presents a very striking appearance from the harbour, as its buildings, owing to the flatness of the land, seem to rise out of the sea. North and south of the entrance are Sullivan's and Morris's islands, the former of which is a popular bathing place, and at the entrance is a lofty lighthouse. Charleston is of great commercial importance as the chief outlet for the cotton and rice of a large district, and there is also a large coasting trade in cotton, rice, phosphates for manure, and lumber, a large deposit of bone phosphate existing in the neighbourhood of the city. There are large rice, cotton, and other mills, and sulphuric acid is extensively manufactured; and there is a large wholesale trade in dry goods. Charleston is the seat of a Catholic and of an Episcopal bishopric, and the churches are numerous, as are also the schools and other places of education, among which is the state military academy. The city is well and elegantly laid out, has abundance of trees, and a good water supply from a deep artesian well. Founded by English settlers in 1680, the town was twice attacked unsuccessfully by the British forces during the War of Independence, and was finally taken in 1780 and held for two years. The bombardment of Fort Sumter was the first overt act in the Civil war, and after its surrender the Confederates held the city till 1865, when they evacuated it, after setting fire to all the important buildings, upon the advance of General Sherman.

Charleston, the capital of Kanawha county and of West Virginia, is at the junction of the Elk with the Great Kanawha river, 369 miles north-west of Richmond. Its productions are bituminous coal and salt.

Charlet, Nicolas Toussaint (1792–1845), a Parisian designer and painter, especially of military subjects. In his youth he was employed at the Mairie as a registrar of recruits, but was dismissed by the Bourbon party for fighting on the Emperor's side in 1814. Entering the studio of Baron Gros, he soon made himself famous by his lithographed designs and drawings and etchings, not only on military subjects, but also on scenes of town and country life, in which he displayed much humour. He had much to do with keeping alive the spirit of Chauvinism (q.v.) in France.

Charleville, a French town in the Ardennes department, on the left bank of the Meuse. a suspension bridge uniting it with Mezières. It has an export trade in coal, iron, wine, slates, and spirits, and has firearm, hardware, and nail factories.

Charlotte of Wales, Princess (1796–1817), the daughter of George IV.—then Prince Regent—and Caroline of Brunswick. She was brought up in great seclusion, and while still young was engaged to Prince William of Orange, an engagement which she broke off, much to her father's disgust, in 1814. In 1816 she married Prince Leopold of Saxe-Coburg (afterwards Leopold, King of the Belgians), and died the next year in child-bed.

Charlottenburg, a Prussian town on the Spree, four miles west of Berlin, and connected with it by a fine promenade. It is a favourite resort of the inhabitants of Berlin, and in the mausoleum in the castle grounds are buried Frederick William III. and his wife, and their son, the Emperor William I., and the Emperor Frederick. The castle was built in 1696 for the Electress Sophia Charlotte, after whom the town was called. There are spinning-mills, breweries, and distilleries, and oil factories, and there is an artillery and engineering school, and a royal institute of glass-painting.

Charlottetown, the capital of Prince Edward Island in the Dominion of Canada, on the left bank of the Hillsborough river, which, by its junction with York river, forms a good harbour by which the largest vessels can ascend the river for many miles. There are shipbuilding yards, an iron foundry, a woollen factory, and several churches and colleges.

Charm, a form of words repeated or written with intent to bring about some supernatural result. The word passed into English through the French, from the Latin, in which language it was originally applied to a magical formula (Hor. *Ep.* xvii. 4), and, by extension, to any magical rite (Verg. *Ecl.* viii.). A similar extension of meaning has taken place in our own use of the word.

Charnel House (Latin, *carnalis*, from *caro*, *carnis*, flesh), a mortuary chapel or vault containing the bodies or bones of the dead. In some Roman Catholic countries (*e.g.* Brittany, and parts of Switzerland) it is customary, after the flesh of bodies has decomposed, to transfer the skulls and some of the larger bones to such chapels (called *ossuaires* in Brittany), where they are arranged on shelves. The crypts (q.v.) of churches were sometimes employed thus in mediæval England, and there are numerous skulls in a building attached to the church of Hythe in Sussex.

Charon, in Greek mythology the Son of Night and Darkness, whose duty it was to ferry the dead across the river that separates this world from the next, receiving as his reward the death-penny that was placed in the mouth of every corpse.

Charpie (French, *charpie*; Latin, *carpo*, I pluck), a preparation of linen for dressing wounds.

Charr, the popular name of a group (*Salvelini*) of the genus Salmo, distinguished by the absence of teeth on the body of the vomer (q.v.) from true salmon and trout (*Salmones*), which they resemble in form and habit. Charr are found principally in mountainous lakes, frequenting clear water, and

feeding on insects and Entomostraca, to the latter of which the pinkish tinge of the flesh is probably due. Dr. Günther records thirteen species, of which the most important are, *Salmo umbla*, from the Swiss lakes; *S. salvelinus*, from the highlands of Austria and Bavaria; *S. alpinus*, the northern charr; *S. willughbii*, from Windermere; *S. hucho*, sometimes called the bull-trout (q.v.), from the Danube, and *S. fontinalis*, the brook-trout of American authors, recently introduced into British lakes. Other species or varieties are recorded from Scotland, Wales, and Ireland.

Charron, PIERRE (1541–1603), a French philosopher, who, after studying law at Orleans, practised as an advocate in Paris. Failing at the bar, he entered the church and became a great preacher, and formed a friendship with Montaigne, who had much influence over him. From being the great champion of orthodoxy, he suddenly became the exponent of intellectual scepticism after the school of Montaigne. In politics he was a despiser of the commonalty, an opponent of popular freedom, and an upholder of royal prerogative.

Charrua, a large and warlike nation of South Brazil and Uruguay, formerly dominant between the Rio da Prata and the Mirim lagoon. They were gradually driven by the "Paulistas" (the enterprising white settlers in the province of St. Paul) from the open steppe country to the South Brazilian forests, where a few groups appear still to survive. The Charruas were specially noted for their extremely dark complexion, being described by early Portuguese writers as "black." They were very fierce and cruel, and displayed extraordinary skill in the use of the bow and sling.

Chart, a sea-map upon which are indicated not only the configuration of rocks and coasts, the

CHART.

nature and characteristics of marks, buoys, and lights, and the set of currents and tides, but the depth of water and the nature of the sea-bottom, with any other particulars that may be of use to navigators. In British charts depths are marked in fathoms of six feet; distances are calculated in cables of one-tenth of a sea-mile. The meridian used is that of Greenwich. Russia, Germany, Sweden, Denmark, Norway, Holland, Austria, and the United States, also use the Greenwich meridian, but France uses that of Paris (which is long. 2° 20′ 9·4″ E. of Greenwich), and Spain, that of San Fernando, Cadiz (which is long. 6° 12′ 16″ W. of Greenwich). In foreign charts the depths, or low water soundings, are generally thus expressed:—

		English feet.	English fathoms.
Denmark } Norway }	Favn	6·175	1.029
Holland	Vaden	5·575	0·929
France	Brasse	5·329	0·888
France	Metre	3·281	0·547
Germany	Faden	5·906	0·984
Portugal	Braca	6·004	1·000
Russia	Sajen	6·000	1·000
Spain	Braza	5·492	0·915
Sweden	Famn	5·843	0·974

The quality of the bottom is usually expressed by some conventional contraction, *e.g.* r., rock; y., yellow; crl., coral. The invention of charts has been ascribed to John, King of Portugal. Very good English charts were prepared before 1580. The best of them are now constructed under the direction of the Hydrographic Department of the Admiralty, from actual surveys by naval officers and others. They are published by the Admiralty for the information of all who have occasion for them.

Charter. This word is from the Latin *charta*, and is of uncertain origin. The Greek form of the word is *chartes*, and it appears to have signified writing material made of papyrus. The term was afterwards applied, not only to the materials for writing, but to the writing itself, as to the letter or the leaf of a book. In English law it was supposed to denote any public instrument, deed, or writing, being written evidence of things done between man and man, and standing as a perpetual record. Among the Saxons such instruments were known as *genrite* or writings. At the present day it is best known as the document by which the express consent of the Crown is given. The term is more particularly applicable to the creation of corporations and other institutions, though it also applies to other exclusive rights granted to individuals or companies. As regards corporations the Crown's consent is presumed in the case of those existing by prescription, such as the City of London and many others which have existed as corporations time whereof the memory of man runneth not to the contrary, and therefore are regarded in law as well created. The consent of the Crown when express may be given either by Act of Parliament or by charter, the authority of Parliament, as regards the creation of corporations, having been usually exercised only in recognition of, or in aid of, but sometimes in regulation of the royal prerogative. Thus the Charter of the Royal College of Physicians (10th Henry VIII.) was confirmed by the statute 14

and 15 Henry VIII. c. 5. Again, the Corporation of the Bank of England was created by the Crown under the regulative provisions of an Act passed in the reign of William and Mary, and by an Act passed in the reign of William IV. (5 and 6 William IV. c. 76), it is enacted that upon the petition of the inhabitant householders of any borough in England or Wales, the king may by his charter incorporate such borough according to the provisions of that Act. But the power of Parliament has of late been most frequently invoked for the incorporation of public and other trading companies, though a simpler method of forming such companies is provided by the Limited Liability Acts (q.v.), and the Crown may still, and not unfrequently does, by its own charter or letters patent, erect a corporation. A charter of incorporation may be forfeited through negligence or abuse of its franchises. [CORPORATION, MAGNA CHARTA.]

Charterhouse (a corruption of Chartreuse), originally a Carthusian monastery in London, close to Smithfield, founded in 1371 on the site of a burying-field for those who had died of the plague. Confiscated at the dissolution of the monasteries in 1535, it became the family seat of the Dukes of Norfolk, and both Elizabeth and James I. stayed there; the latter on his first entry into London. In 1611 Thomas Sutton bought it and made it a school for boys, and an asylum for eighty poor gentlemen ("Brothers"). The school was removed to Godalming in 1872, and now ranks as one of the great public schools. The governors of the Merchant Taylors' School, a large London day school, purchased the site and transferred their school there. The buildings are mostly of the 17th and 18th centuries. The master's lodge contains valuable portraits. Addison, Steele, Wesley, Grote, and Thackeray were educated at the school, and it is familiar to readers of the latter.

Charter Party. An instrument in writing (with or without seal) by which a party exporting goods from Great Britain, or importing them from abroad, engages for the hire of an entire vessel for the purpose, at a freight or reward thereby agreed for. Upon the execution of such an instrument the ship is said to be chartered or freighted, and the party by whom she is engaged is called the charterer or freighter. But where, instead of taking the entire vessel, the owner of goods merely bargains for their conveyance for freight by any particular vessel (other goods being at the same time conveyed in her for other proprietors) she is described not as a chartered, but as a general ship, and in this case no charter party is usually executed but merely a bill of lading. A charter party is commonly made between the owner or the master (as the case may be) on the one part, and the owner of the goods on the other, and purports to be an agreement that the ship shall be employed in the conveyance of goods for a certain voyage (or for a certain period of time) at a certain amount of freight, calculated at so much per ton, or at so much per month during the voyage. The instrument also usually engages on the part of the ship-owner that, being seaworthy and provided with necessaries, she shall receive a full cargo on board, not exceeding what she can reasonably carry, and that the same shall be properly stowed, and that the ship shall then immediately sail (wind and weather permitting) on the specified voyage and deliver the cargo (the act of God or of the king's enemies excepted) at the port of destination to the charterer or his assignees, in as good order as they were received on board, and on the part of the charterer that he will supply a full cargo, and load and unload the goods within a certain number of days (usually called lay or running days), and pay a freight as agreed upon, and that if he detains the vessel beyond the running days, he will also pay demurrage, that is a certain amount per diem for the whole period of such extraordinary detention. In the performance of this contract the ship-owner must take good care of the cargo during the voyage, and will be liable for any damage from the master's negligence or otherwise, or for loss or non-delivery of goods unless occasioned by causes within the exceptions of the charter party. If the ship-owner being prevented by an accident for which he is not responsible from entirely performing his contract, yet performs it in part by carrying the cargo safely during a certain portion of the voyage and the charterer receives the benefit of such performance, freight will then be due *pro ratâ itineris.*

Chartier, ALAIN (1380-1449), a distinguished French writer of the fourteenth century, born at Bayeux, and employed by Charles VI., whose court he followed, in the troublous times of Agincourt and the Maid of Orleans. His poetry was so admired by his contemporaries that young gentlemen and pages used to learn it by heart, and Margaret of Scotland, the wife of the Dauphin, is said to have kissed, as he lay asleep, the mouth from which issued such noble words. His best known work is *Le Livre des Quatre Dames*, said to have been called forth by the battle of Agincourt.

Chartism, in English history (1837–1848), though a political movement, arose mainly from economic causes. There was much distress and discontent among the labouring classes, due mainly to the existence of the Corn Laws, and stimulated by the necessary, but severe, new Poor Law of 1834. The troubles between capital and labour due to the "factory system" and the substitution of machinery for hand labour, and the severe laws against combination of workmen for trades-union purposes had also a large share in producing the feeling which found expression in the movement. The Reform Bill of 1832 had transferred political power from the landowners to the middle classes, but had practically ignored the artisans and labourers. On the accession of Queen Victoria in 1837 a petition was drawn up asking for a further extension of the franchise. Lord John Russell's ministry declining to reopen the Reform question, a conference between Liberal members of Parliament and working-class leaders drew up a programme of reform, comprising six points—universal suffrage, annual parliaments, the ballot, the abolition of the property qualification then requisite for

members of Parliament, and equal electoral districts. This programme was named the People's Charter by Daniel O'Connell. Prominent leaders of the movement were Feargus O'Connor (who afterwards went mad), Ernest Jones, and Henry Vincent. In 1839 Vincent was imprisoned at Newport, Monmouthshire, and an elaborate attempt at rescue was made by 10,000 armed men, marching in three divisions, led by Frost, an ex-magistrate. Some misunderstanding among the leaders caused the attempt to fail, and Frost, Jones, and Williams were tried for high treason and sentenced to death, but the sentence was commuted to transportation. This trial, however, spread the movement, bringing in such men as Thomas Cooper, the poet (q.v.). In 1841 such Chartists as were electors helped to upset Lord Melbourne's administration by joining the Tories at the general election. In May, 1842, a monster petition was presented to the House of Commons, and it was moved that the petitioners should be heard at the bar by counsel, but the motion was opposed by Macaulay, Peel, and Roebuck, and rejected. The repeal of the Corn Laws partly allayed the agitation, which was revived in 1848 in sympathy with the revolutionary movements in France and on the Continent. A monster meeting was arranged for April 10th on Kennington Common (now Kennington Park) to march in military order to the House of Commons, and present a petition for legislation embodying the six points. The Government declared the meeting illegal, and troops (skilfully kept out of sight by the Duke of Wellington) were detailed to protect the various public buildings and break up the procession if necessary. Many of the more ardent Chartists favoured an armed resistance, but the night before the meeting, in deference to the advice of Feargus O'Connor and other leaders, the plan was abandoned, and the physical force men withdrew from the project altogether. Great alarm was felt in London, and 200,000 special constables were sworn in to preserve the peace. The petition was presented, and stated to be signed by 5,700,000 persons, but it was found, on examination, that the signatures numbered only about 2,000,000. and included a number of signatures, frequently repeated, purporting to be those of the Queen, Prince Albert, the Duke of Wellington, and various characters in the novels of Capt. Marryat and other popular literature. A subsequent demonstration on Whit Monday, May 12th, was a pitifnl failure, and, though some riots took place in Lancashire, the movement gradually died out, killed by the failures of April 9th and 10th. *See* Justin McCarthy's *History of Our Own Times.*

Chartres, the Roman Autricum, capital of the Eure-et-Loire department in France, 55 miles S.W. of Paris, is on sloping ground overlooking the Eure, which divides into two channels, one inside, the other outside of the boulevards, which mark the former ramparts, and consists of an upper and a lower town united by steep streets. At the summit of the upper town is the eleventh century cathedral of Nôtre Dame, considered one of the finest in France, with its two lofty spires, its three rose windows, and its many windows of thirteenth century glass. In the Marché aux Herbes an obelisk commemorates General Marceau. It produces wool and leather, and is noted for its corn-market, which is managed by women. The town gives the title of duke to the eldest son of the Orleans branch of the Bourbons.

Chartreuse, or La Grande Chartreuse, in the Isère department, 14 miles from Grenoble, and 4,268 feet above the level of the sea, is the famous Carthusian monastery, founded by St. Bruno in 1084. The convent had formerly an extensive property, but this was confiscated by the State in 1793. The monks were allowed to return from exile in 1816. They were threatened with expulsion in 1880, and made preparations for it by transferring their library to a new monastery at Cowfold, in Sussex. Some monks, however, still remain. They received Queen Victoria and Princess Beatrice in 1887. The monastery is famous as being the original place of manufacture of the Chartreuse liqueur, which, green or yellow or white, has been tasted by most people.

Chase, Salmon Portland (1808–1873), an American statesman and judge. Born in New Hampshire, he studied law, and in 1830 was called to the bar, making a great reputation in Ohio. He was a great opponent of slavery, and held that it was only an institution of individual states, and not one to be upheld by the National Government. In 1849 he became a member of the senate, and in 1855 was elected governor of Ohio, being re-elected two years after. In March, 1861, under President Lincoln, he became Secretary of the Treasury, a post which he retained till 1864, and showed great zeal and ability, though the wisdom of some of his financial measures has been greatly questioned. In 1864 he was appointed Chief Justice of the Supreme Court, and presided at the trial of President Johnson. He might have secured the Democratic nomination to the Presidency in 1868, but his views admitting the possibility of negro suffrage, he was rejected by the majority of the Convention.

Chasidim (Heb. *holy*), (1) a Jewish sect in the time of the Maccabees, noted for their austere observance of the letter of the law and of various rules deduced by them from it, like the Pharisees (q.v.), who, indeed, were a development of them. (2) In 1740 a sect of the name was founded in Podolia by a certain Israel Baal Shem ("Possessor of the Name," *i.e.* the Secret Name of God). Their creed is based on the Cabbala (q.v.), and is saturated with mysticism. At the death of their founder (1760) they split up into many congregations, each led by its own "Tsaddik" or saint, who is regarded as infallible, and who is supposed to work miracles, to have the power of protecting against disease, and to heal by his benediction. Their object is to obtain complete union with the Divine Essence, and their worship involves strange forms of religious excitement. They are said to be numerous in Poland, Roumania, Galicia, and Palestine.

Chasles, Michel (1793–1880), a Frenchman of science, born at Chartres, and educated at the École Polytechnique, from which he passed as an officer of engineers, but resigned his place in favour of a comrade. He wrote upon mathematical subjects, and was in 1841 appointed to the chair of machines and geodesy in the École Polytechnique, and in 1846 to that of higher geometry at the Sorbonne. He wrote many works upon scientific points, especially geometry, and is considered one of the first geometers of the century. In 1867–1869 he defended the authenticity of certain letters (afterwards proved forgeries) of Pascal and Newton, transferring the credit of Newton's discoveries to Pascal. Their forger, one Irène Lucas, was convicted in 1869.

Chasles, Philarète (1798–1873), a French writer born near Chartres. A follower of Rousseau from youth, he was imprisoned at the Restoration along with the Jacobin bookseller to whom he was apprenticed. Released from this imprisonment by the intervention of Chateaubriand, he was employed at a bookseller's shop in England, and studied deeply English literature, and so was able on his return to Paris to review English books in the *Révue Encyclopédique*. Two of his works were crowned by the Academy, and in 1841 he was appointed professor of northern languages in the Collège de France. Among other English subjects he wrote of Charles I., Mary Stuart, Cromwell, and Shakespeare.

Chassé, David Hendrick, Baron (1765–1849), a famous Dutch soldier, chiefly remembered, perhaps, for his defence of the citadel of Antwerp, with 5,000 men against 60,000 Belgians and French at the Belgian revolution in 1832. He began his military life at ten years old, and became a lieutenant-general in the French service in 1793. Napoleon used to call him General "Bayonet," owing to his fondness for employing that weapon. At the battle of Waterloo he did good service against the French as Lieutenant-General of the Dutch forces.

Chassepot, Antoine Alphonse, who was born in 1833, was at first a workman in the small-arms factory at St. Thomas, near Paris, but greatly improved his position in consequence of his successful efforts to develop the principle of Dreyse's needle-gun. His rifle, known as the Chassepot, and now superseded by the Lebel type, was adopted by the French army in 1866. Its weight was 8 lb. 14 oz. 13 dr.; its calibre, ·433 inch; the weight of its cartridge, 578·4 grains; the weight of its bullet, 370·4 grains; and the weight of its charge of powder, 84·8 grains. It was rifled with four grooves. M. Chassepot died in 1886.

Chasseurs (Fr. *hunters*), certain regiments of light infantry and light cavalry in the French army. The gamekeepers on the royal domains of Prussia formed a special corps in the last century; and in 1743 a company of 100 men (foot), armed like them, was added to the French army. In 1757 the number was increased, and 200 cavalry were added. In 1779 six regiments of chasseurs were organised. During the wars of the Revolution and the First Empire the number varied from 12 to 31 regiments. The Chasseurs d'Afrique (mounted) were raised in 1831 for service in Algeria. At present (1892) there are 21 regiments of mounted chasseurs in the French service, and six of Chasseurs d'Afrique. There are 30 battalions of chasseurs-à-pied, each of four or six companies. A company consists of 19 officers and 552 men.

Chasuble (Lat. *casula*, a little cottage, because, according to St. Isidore of Seville, it covers the whole person), originally the outer garment of the poorer classes, clergy and laity alike, under the later Roman Empire. Gradually, however, its use became confined to the clergy, and its shape much modified. Originally a sleeveless circular cloak, with an opening for the head, and (we are told) a hood, it has become oval in the Roman Church, and is often elaborately decorated. In the Roman Church it is reserved for the officiating priest at the mass. In the Anglican Church it is often worn by the High Church clergy when celebrating Holy Communion. The Eastern Church also has it.

Chat, any bird of the genus Saxicola of the thrush family, with 36 species from Africa, the north-west of India, and the whole Palæarctic region, migrating to Alaska and Greenland. The beak is straight and slender, and surrounded with a few bristles. [Stonechat, Wheatear.] The Yellow-breasted Chat of the United States is *Icteria virens*. one of the hang-nests (q.v.).

Chata (*Pterocles alchata*), a species of Sand-grouse (q.v.).

Chateaubriand, François René, Vicomte de (1768–1848), a French writer and politician—the father of the French Romantic school—was born at St. Malo, and spent his early youth among the romantic surroundings of Brittany. In 1790 he departed for America with a view to finding the North-West Passage, and spent eight months there. the events of which he recorded in his *Voyage en Amérique*. He returned about the time of Louis XVI.'s execution, and went with the other émigrés to England, where he lived for some years, maintaining himself by literary labour, studying at the same time English literature, and maturing his prose epic of the Red Indian race, *The Natchez*. In 1797 he published an *Essai sur les Révolutions*, and having returned to France in 1800 he published in the next year *Atala*. This, which is similar in style and effect to Paul and Virginia, made a great sensation, and established its author's reputation by its style and eloquence, which marked a new departure in French literature. In 1802 he published his *Génie du Christianisme*, which displays more eloquence than argument, and pleased Napoleon, who was just then restoring the Catholic religion in France. He appointed Chateaubriand to a diplomatic post, which the latter resigned upon the murder of the Duc d'Enghien. *René*, which is thought to reveal the state of Chateaubriand's own heart, had already appeared before

Les Natchez was published in 1826, which year saw also the publication of the *Last of the Abencerrayes*. As a politician, Chateaubriand had published in 1814 a pamphlet *Bonaparte et les Bourbons*, a work which Louis XVIII. said stood him in the stead of 100,000 men, and in gratitude the king made much of him. He, however, was in the Liberal Opposition, and on a change of government was successively ambassador to England, representative at the Congress of Verona, and ambassador to Rome. On the accession of Louis Philippe he refused allegiance, and his political life was practically ended. His posthumous *Mémoires d'outre Tombe* probably occupied most of the time of his retirement. He is buried, by his own desire, on a rocky islet off St. Malo.

Châteauroux, a French town, capital of the Indre department, on the left bank of the Indre, 90 miles S.W. of Orleans. Its principal manufacture is that of woollen goods, and there is a trade in leather, iron, cattle, and lithographic stone which is quarried in the neighbourhood.

Châtelet-Lomont, Marquise du (1706–1749), a learned Parisian lady, who, to a knowledge of Latin and Italian, mathematics, and physical science, added great wit and beauty. She is said to have been successively the mistress of Voltaire (who lived with her at one of her husband's chateaux for several years), and of a Captain of French Guards. She wrote *Institutions de Physique* and made a French translation of Newton's *Principia*.

Châtellerault, a French town in the Vienne department, on the second bank of the Vienne, over which a stone bridge leads to the suburb of Châtcauneuf. It stands in a fertile valley, and is 24 miles N. of Poitiers, and 80 miles S. of Tours. It is a principal seat of the French cutlery trade, and there is a Government sword and bayonet factory, and the town has a considerable trade. The title of Duke of Châtellerault is claimed by the Duke of Hamilton and the Duke of Abercorn, as descended by the female side from the original James Hamilton Earl of Arran, to whom it was granted in 1548. A decree of Napoleon III. confirmed the title to the former.

Chatham, in Kent, is situate upon the south side of the Medway, about 15 miles from its junction with the Thames, and 27 miles east of London, and forms one continuous town with Rochester. The town itself is neither interesting nor beautiful, as Dickens points out in his *David Copperfield*, but it is of great importance as a military and naval station, and is extensively fortified by a line of detached forts, intended to defend it from an enemy advancing from the south, as well as by forts on the Medway side. These fortifications are for the most part in the village of Brompton, though of late a chain of still further outlying works is being constructed. These works, as well as many of the docks, are the result of convict labour, and Chatham is one of the chief convict stations. Fort Pitt, on the W., near the Medway, is now a military hospital. The extensive barracks, two garrison hospitals, the arsenal, the gymnasium, the military school for engineers, the convict prison, and the dockyards are all included within the famous "Lines." There is a great naval dockyard at Chatham which is nearly two miles long, and has lately been largely extended in other directions. Chatham was of little importance till Elizabeth established the dockyard, and built Upnor Castle upon the other side of the river to defend it. It sends one member to Parliament. There are several brickyards, limekilns, and flour mills in the neighbourhood, and the presence of the garrison and dockyard men gives plenty of trade to the town. Traces of Roman villas and other Roman remains have been found, and in the church of St. Mary there is a monumental brass to Stephen Brough, discoverer of the northern passage to Russia. In 1667 De Ruyter sailed up the Medway and set fire to the shipping at Chatham.

Chatham, William Pitt, Earl of (1708–1778), a great English statesman and orator, was born at Westminster, and educated at Eton and at Trinity College, Oxford, where his favourite author was Demosthenes, and whom he translated and retranslated to attain to facility of expression. At his father's death in 1727 he entered the army as cornet. In 1734 he entered Parliament as the member for Old Sarum, and soon became a prominent member of the Whig opposition to Walpole's government, and became so annoying a critic that Walpole punished him by procuring his dismissal from the army; but being appointed groom of the chamber to the Prince of Wales, Pitt continued to harass Walpole, and was one of the chief instruments in bringing about his downfall in 1742. The king, who resented the terms in which Pitt had spoken in debate of the House of Hanover, was opposed to his entry into the ministry, and it was not until 1746 that he was admitted into the Pelham ministry as first vice-treasurer of Ireland, and then as Paymaster-General—a post which gave him a seat at the Privy Council—and which, by giving him the occasion of displaying at that time unusual integrity, led to the confidence afterwards reposed in him by the nation.

In 1754, though still in office, he attacked his own Government, and was constrained to resign. But in 1756 Pitt was again in office as Secretary of State and leader of the Commons, under the Premiership of the Duke of Devonshire. In 1757 he was again out of office, but so strong was the confidence expressed by the public at large in the "Great Commoner," that he was soon back as virtual, though not nominal, Prime Minister. This was the celebrated four years during which Pitt's life has been called the history of England. It was he that chose General Wolfe, and so brought about the taking of Quebec; his encouragement of Clive led to the founding of our Indian Empire; and by his aid Frederick the Great ended the Seven Years' war. With the accession of George III. and the advent of Lord Bute to office arose difficulties, especially that of the Bourbon League, which led to Pitt's retirement, and he accepted a pension of £3,000 a year, and a peerage for his wife.

In 1766 he supported the bill for repealing the American Stamp Act, and in the autumn of that year he was entrusted by the king with the formation of a ministry. With its formation he went to the Upper House as Viscount Pitt and Earl of Chatham—a step which cost him much in popularity. At this point of his career, just when a most critical juncture had arisen, especially with regard to the American question, a mysterious illness utterly incapacitated him for business, and the Ministry were virtually without a head. He remained in retirement, and in 1768 he resigned on the ground of ill-health. In 1770 he appeared again in the House of Lords as the opponent of the Government on their American policy; and in 1778 he spoke for the last time against concluding a peace. The famous historical picture has made everyone acquainted with the details of this scene, and how the stricken peer was removed from the House to die the next month at Hayes. The great defect in Chatham's political career seems to have been the inconsistency with which he changed his opinions when the change brought power. In this he is not without later imitators.

Chatham Islands, so called from the name of the ship *Chatham*, commanded by Lieutenant Broughton, who discovered them in 1791, are a group of islands in the Pacific, 560 miles E. of New Zealand, to which they belong. The group consists of three islands and some rocky islets. Chatham Island, the largest of the group, contains over 305,000 acres, and has in it a large lake twenty-five miles long, and six or seven broad, which sometimes bursts through a separating sand-bank and communicates with the sea. The island is fertile, and produces much flax, and the climate is mild. The vegetation generally resembles that of New Zealand, but the trees are much smaller. Many horses and cattle are bred for the New Zealand market.

Chati (*Felis mitis*), an American cat, ranging from Mexico to Paraguay. It is probably a variety of the Margay (q.v.).

Chat Moss, the largest bog in England, though its dimensions have been much lessened of late years by constant and improved drainage, is about seven miles west of Manchester. Parts of it are now solid, where twenty-five years ago horses employed in the works connected with the drainage had to wear plates of wood—a kind of snow-shoe—to keep them from sinking in. In 1829 George Stephenson, after long struggling in vain to carry his railway over the moss, hit upon the expedient of floating it upon a foundation of boughs and hurdles, cutting deep drains by the side, and in the centre forming beneath the line a drain composed of old tar barrels.

Chatsworth, a celebrated seat in Derbyshire on the Derwent, near the villages of Bakewell and Edensor, and eight miles W. of Chesterfield. The building, which is almost a square surrounding a quadrangle, is of Ionic style, and presents a fine appearance from the river. Part of it is of the 17th and 18th centuries, and part dates from 1820. There is a fine library, and some beautiful wood carvings, paintings of the old masters, and sculptures. The park and gardens are ten miles round, the latter covering twelve acres, and having a grand conservatory, erected by Sir Joseph Paxton, of an acre, and the waterworks almost rival those of Versailles. The present building was begun in 1688 by the first Duke of Devonshire, and finished in 1840 by the seventh duke.

Chattanooga, the capital of Hamilton county, Tennessee, in the United States, is on the left bank of the Tennessee, which is navigable during eight months of the year. There is also good railway accommodation, and there is much trade in coal, iron-ore, and timber, produced in the district. Saw-mills and wood-work factories are the chief industries. General Grant here defeated the Confederates in 1862 and 1863.

Chattel (Lat. *capitale*, the same word as capital and cattle), properly a single head of cattle, or a single article of movable property; in English law the term strictly includes all property which is not freehold. Interests on lands, buildings, etc., are classed as chattels real, while articles of personal property are classed as chattels personal. The rules of succession in respect of these two classes of property differ considerably. [Real Property, Personalty.]

Chatterer, the popular name of birds of the family *Ampelidæ*, with four genera and nine species, characteristic of the Nearctic and Palæarctic regions, but ranging to Costa Rica and the West Indian Islands. [Cedar-bird, Waxwing.]

Chatterton, Thomas, poet, was born in 1752 at Bristol, a few months after his father's death. After attending Colston's Bluecoat school, he went as apprentice to an attorney at the age of fourteen. After hoaxing his usher, and making five shillings out of a made-up pedigree, he hoaxed the whole of Bristol in 1768 with a description of the opening of Bristol old bridge "from an old manuscript" which he professed to have found in St. Mary Redcliffe church, Bristol. In 1769 he approached Sir Horace Walpole, sending him a copy of *The Ryse of Peyncteynge, written by T. Rowlie*, 1469, *for Master Canynge*. Walpole, who was then engaged upon his *Anecdotes of Painters*, was charmed with this, and nearly committed himself. Losing his situation, Chatterton, in 1770, removed to London, and was well received amongst the publishers. His prospects at first were fair, and he worked hard with his pen. At length, however, his means began to give way, and on August 24th, 1770, losing hope, penniless and hungry, he shut himself in his room, destroyed his papers, and took arsenic. He was found dead next morning, and was buried in the pauper's pit attached to the city workhouse, Shoe Lane. His chief poetical productions are those that were published under the pseudonym of Rowley, and written while he was still at Bristol, and therefore but a boy. They include *Elinoure and Juga*, written while he was at Colston's school, *Bristowe Tragedy, Ælla, a Tragycal Interlude, The Battle of Hastings*, etc. These are among his spurious

antiques. His modern poems are of singular beauty. and place him alongside of Keats in English literature.

Chaucer, GEOFFREY, was born in the year 1340, probably at London. but his birthplace is not authenticated. Nor is anything known of his parentage. One Richard Chaucer, a vintner, has been supposed by some to have been father of the poet, but this is mere conjecture. The first accurate information that we have regarding Chaucer is the fact that he was from 1356 to 1359 a page to Elizabeth, wife of Prince Lionel, third son of Edward III. We know, from his own words, that he served as a soldier in his youth, and it is likely that he was with the English army in France in the autumn of 1359, when the imprisonment took place to which he himself refers. It cannot be determined whether he studied at any of the Universities, but he had been, at any rate, an acute and industrious student. He undoubtedly possessed a wide acquaintance with the general intellectual acquirements of the age in which he lived; he knew the classics, divinity, astronomy, and all that was then discovered about chemistry. We get the next definite light on Chaucer's career from an entry in the Issue Rolls of 1367, where reference is almost certainly made to him as one of the "valets of the king's chamber." At this time also the poet appears to have had that love affair, the result of which was the rejection of his suit, and then the composition of his first original poem, the *Compleynte to Pite* (pity). In 1369, on the death of Blanche, the wife of John of Gaunt, the friend of Chaucer, he composed his memorial poem, *The Death of Blaunche the Duchesse.* In 1370 Chaucer entered on the diplomatic engagements which seem to have been entrusted to him from time to time. During this year he was abroad in the king's service. In 1372 he formed one of a commission, with some citizens of Genoa, to arrange as to an English port which might be used for Genoese commercial purposes. He remained in Italy about a year, during which time he also visited Florence. It is possible, though not certain, that he now met Petrarch. Shortly after his return to England he received the distinction from the king of a daily grant of a pitcher of wine, changed in 1378 to a yearly payment of 20 marks. In the same year he was appointed controller of the customs and subsidy of wools, skins, and leather, in the port of London; and he was further enriched now by the receipt of a pension from the Duke of Lancaster. His Italian journey, and the consequent study of Italian literature, had a marked influence on the poet's work. His *Troylus and Creseide*, among others, indicates this. In 1377 Chaucer accompanied Sir Thomas Percy on a secret mission to Flanders, and it is supposed that he was also somewhat later in the year one of those sent to treat in regard to peace with Charles V. of France. On the accession of Richard II. in 1378 he was again appointed one of the royal esquires. He may have made two official journeys in the course of this year—one to France to discuss the marriage of Richard with the French king's daughter; the other to Lombardy, on a matter relating to the peace of England. Not only did Chaucer as formerly accomplish his missions successfully, but a marriage-poem, which he composed in honour of the young queen, enhanced his esteem at Court. In 1382 he was re-appointed to his former office as controller, but this time by deputy. In 1386 he was elected member of Parliament for Westminster. Chaucer's prosperity was now at its height. From this period dates the composition of his *Canterbury Tales.* Now, also, he wrote his *Legende of Good Women.* This season of good fortune, besides being productive of some of his best work in verse, also introduced him to several congenial friendships. There were now associated with him on intimate terms Gower, Lydgate, Occleve, and other men of note. A change in the lot of the poet, however, soon took place. Just when the ripest and best of his poetical work was being produced in the *Canterbury Tales*, he was met by business reverses. In place of his friend, John of Gaunt, Duke of Lancaster, Thomas, Duke of Gloucester, had become the favourite of the young king; reforms and alterations took place under his management, and among these was the entire loss to Chaucer of his controllerships. There can be no doubt that the disaster arose not through his own fault, but from the fact that he was an adherent of the Lancaster party. Following this loss came others. His pensions had had to be mortgaged, and were finally paid over to creditors. It is characteristic of the robust nature of the man that he still kept a good front to his difficulties, and it may well be that his noble *Balade of Truth* ("Flee fro' the press") was written at this time. His misfortunes were crowned by the death of his wife in 1387. A change for the better in Chaucer's affairs came, in 1389, by the restoration of the Lancaster party to office. The poet was appointed clerk of the king's works at Westminster, at a salary equal to about £1 a-day of our money. This income, if it did not last long, was for the time helpful. In 1391 he wrote his treatise on the *Astrolabe;* most likely his *Stedfastness* and other shorter pieces were composed between this date and the year 1399. In 1394 Chaucer received a pension from the king of £20 a-year for life. but he does not appear to have been in very comfortable circumstances about this date. Four years later a still further mark of the king's goodwill was shown towards him by the grant of letters of protection against arrest. A distinct revival in the poet's prosperity ensued with the accession of the young king, Henry IV., son of the Duke of Lancaster. His pension was doubled, and he had a humorous fling at his poverty in his address *To his Purse.* Towards the close of 1399 Chaucer went to occupy a house he had leased in the garden of the Chapel of St. Mary, Westminster. There he died after a brief stay, October 25, 1400.

From the year 1868, when the Chaucer Society was founded, much has been done both in England and Germany to throw light on the life and work of the poet. In regard to his biography, not a little fresh knowledge has been obtained by researches in the Patent and Issue Rolls, while the

scholarly investigations of Skeat, Morris, Furnivall, and others in Great Britain, and of Professor Ten Brinck in Germany, have virtually settled the authenticity of his poems and the purity of the text. Several pieces formerly attributed to Chaucer have thus been shown not to belong to him—*The Court of Love. The Cuckoo and the Nightingale, The Flower and the Leaf*, and, in all probability, the present version of the *Romance of the Rose.* Chaucer has been the subject of numerous essays. There can be little doubt of his place in English literature among the first four of our greatest poets. As a narrative writer in verse he is unequalled. No more than is essential to a story is given; no touch or episode is omitted that can stir the reader's attention to the close. Vivacity, picturesqueness, humour, he has them all in a remarkable degree. His first great distinction is his rare capability of interpreting a theme of romance. Among subordinate characteristics may be named as most striking his keen appreciation of outward nature. To read some of Chaucer's descriptions of this kind is to feel something of the charm and freshness of nature itself. Taken along with his delight in books, his world-wide charity, his supreme gift of lucid and musical expression, these qualities enable us, at least, to understand, if not to assent to, the opinion of one of his ablest students when he calls him the "true father and founder of what is characteristically English literature."

Chaudor (*Chûdor*), a large Turkoman nation, whose territory extends from the Caspian east to the Aral Sea and the Lower Oxus; chief *taife* (branches):—Abdal, Tgdyr, Esserli, Karachaudor, Bozanji, Burmijuk, and Sheikh, altogether 12,000 tents or 60,000 souls, all now subject to Russian rule.

Chaumette, Pierre Gaspard, Revolutionist, was born in 1763 at Nevers. At first a seaman, then a clerk, he acquired great popularity in the time of the Revolution by his extreme views. He even rejected his name of Pierre, because it was associated with religion, and adopted the name of Anaxagoras in its place. Among his proposals were that every Parisian should wear wooden shoes, and that the gardens of the Tuileries and Luxembourg should be planted with potatoes. Ultimately he was brought to the guillotine on April 13, 1794.

Chaumont, a town of France, capital of the department of Haute-Marne, is situated at an altitude of 1,023 ft. between the rivers Marne and Suize. It has manufactures in woollens, leather, and cutlery. It was here that the allies in 1814 entered into a compact against Napoleon.

Chautauqua, a summer resort on Chautauqua Lake, near Lake Erie, in the extreme west of New York State, U.S., best known as the birthplace of an interesting educational experiment. On a ground previously used for Methodist camp-meetings, a "summer school for Sunday-school teachers" was started by Lewis Miller (a well-known inventor), and placed under the direction of Dr. John H. Vincent. (Besides lecture-halls and an amphitheatre, this ground includes a piece of land laid out, to scale, to represent the Holy Land.) In connection with this school, "home reading circles" were established, whose members follow certain prescribed courses of private reading, and which are affiliated to the Chautauqua Literary and Scientific Circle, whose headquarters are at Plainfield, New Jersey. The central office of the latter advises readers, and prescribes courses of reading. in science, history, and literature. Mathematics and modern languages are necessarily excluded as requiring *vivâ voce* teaching. A complete course takes four years, and entitles the student to a diploma. Some twenty-five per cent. of the students take it. About 25,000 students were on the books in 1885. The diplomas are granted at the annual "Recognition Day" festival, held at Chautauqua, and in several other states. The institution is now incorporated as a "university." "Home reading circles," in imitation, have recently been started in England.

Chauvinism, the French name for that exaggerated zeal for the military glory of one's nation, and that patriotic and somewhat frothy boastfulness which now in England is more commonly called jingoism (q.v.). The name "Chauvin" was popularly given to Napoleon I.'s old soldiers and enthusiastic admirers, and is said to have been derived from one of them, a certain Nicholas Chauvin, who was rendered conspicuous by his serious wounds as well as by his enthusiasm. But the name was brought into vogue by the *Cocarde Tricolore*, a vaudeville by the brothers Cogniard, which had a great success in Paris in 1831, owing partly to its allusions to the expedition to Algiers, where the scene was laid, and to the revolution of 1830. Chauvin is the name of one of the characters, who is first introduced as a raw recruit, whose diet of camel has disagreed with him, but whose subsequent strange adventures in a seraglio and patriotic devotion to the tricolour (the Napoleonic flag, just restored after the expulsion of Charles X.) helped to make the fortune of the piece.

Chaux de Fonds, a town of Switzerland in the canton of Neufchâtel, is situated in a narrow and wild gorge of the Jura, at an altitude of over 3,000 feet. It is one of the leading centres of the Swiss watchmaking trade.

Chavantes, a warlike and predatory Brazilian people, formerly dominant along both banks of the Tocantins, known to the early Portuguese explorers as *Canoeiros* from their great skill in navigating their canoes. Their arms were a very long spear, the bow and arrow, and a massive club; but some of the tribes having been converted by the Jesuits learnt the use of firearms, and afterwards escaping to the woods became very formidable to the white settlers in Goyaz and Maranhâo during the first quarter of the present century. But they were weakened by intertribal wars with their southern neighbours, the equally fierce Acroas and Payaguas. Some are now settled and have become peaceful cultivators and traders about the confluence of the Tocantins and Manoel-Alves-Grande.

Chazars, or KHAZARS, a Sythic, or, more probably, Flemish people of Eastern Europe, by Byzantine writers connected with the Turks. Settled originally on the north of the Caspian Sea, they made frequent raids into Persia in the sixth century, while on the fall of the Sassanide dynasty (q.v.) they acquired part of Armenia, and also the Crimea. Astrakhan on the Volga was long their capital. From the middle of the tenth century their power waned before the growing strength of the Grand Dukes of Russia. In the eleventh century they lost the Crimea, then called Khazaria, and thenceforward disappear from history. The Caspian Sea has sometimes been called Khazarian after them.

Cheating is the fraudulently obtaining the property of another by any deceitful practice not amounting to felony, but of such a nature that it directly affects or may affect the public at large; numerous statutes have been passed to restrain cheating in particular businesses. Moreover, the offence of selling articles, knowing any trade-marks thereon to be counterfeited, is reducible to this head of cheating, as is also the offence of selling by false weights and measures. The general punishment for all cheating indictable at common law is fine and imprisonment, to which by a statute passed in the fifteenth year of the reign of her present Majesty (chap. 29), hard labour may now be added. Cheating at play is punishable in like manner, as obtaining money by false pretences, under Vict. 8 and 9, c. 109.

Chechenz, one of the chief divisions of the Daghestani aborigines, East Caucasus, along the right bank of the Terek, thence south to Vladikavkaz, and nearly to Mount Kazbek; Chechenz is the Russian, Kist the Georgian, and Nakhtchuoi the national name. Chief branches: Ingush, Karabulak, Chechenz proper, and Tûsh; speech extremely rude, and quite distinct from Lesghian and all other Daghestan idioms; square figures, aquiline nose, swarthy complexion, scanty black beard. The Chechenzes offered a most determined resistance to the Russians, and were not finally reduced till the death of their famous leader, Shamyl (Samuel), in 1859. Like the Circassians, most of them had then to abandon their highland homes, or else to migrate to Turkish Armenia, where fresh disasters overtook them. Nearly all are Mohammedans of the Sunni sect.

Cheddar Cliffs, which might rather be called a pass or gorge, a narrow winding fissure in the carboniferous limestone of the Mendip Hills, near Cheddar, in Somersetshire. The fissure, no doubt, originated along a line of fracture, and has a general N.E. and S.W. direction, the beds of limestone dipping across it S. or S.E., from 19° to 24° on one side and from 15° to 23° on the other. The solvent action of carbonated water, frost, and streams running underground, have widened the ravine, most of the material being removed from the north-west or dip-slope side. A road now runs along the bottom of the pass. There are numerous caverns and swallow-holes in the district, and the former by collapse of their roofs may give rise to ravines.

Cheduba, an island of India, is situated in the Bay of Bengal. Its area is about 250 square miles, the soil yields good crops of rice, tobacco, and cotton. Petroleum is also found on the island.

Cheefoo, a treaty-port of China, is situated on the N. side of the Shan-Toong promontory. It is a place of considerable importance from a commercial point of view, its imports being worth nearly £2,000,000 yearly.

Cheese consists of the casein of milk, together with the greater portion of the fats, and small quantities of mineral matter. It is manufactured by causing the coagulation of the casein by adding "rennet" to the milk. The rennet is prepared by treating the stomach of a calf with a strong solution of common salt. When added to the milk the casein coagulates and carries down with it most of the fat. When the precipitation is complete, which is generally the case in about an hour, the coagulated mass, the *curd*, is broken up, and the clear liquor, the *whey*, poured off. The curd is allowed to stand for about an hour, and is then collected and pressed. It is broken up, salted, and again moulded and pressed. It is finally dried in the "*curing*" room at a temperature of about 75°. For the production of the cheese, either the whole milk or skim milk may be used. In the case of cream cheeses, cream is added to the milk. The different varieties of cheese, as Cheddar, Stilton, Gruyère, etc., all possess nearly the same composition, the variations in flavour, etc., being due to slight differences in the details of preparation.

Cheetah (*Felis jubata*), the hunting leopard, sometimes made the type of a distinct genus with the name *Cynælurus jubata*, ranging through Central Asia westward, and into Africa southward to near the Cape. It is about 54 inches long, exclusive of the tail, which is from 30 inches to 33 inches more. The colour is light rufous fawn spotted with black, and the tail is more or less ringed with black. There is a kind of mane on the neck, and the hair on the belly is long and light-coloured. The head is short and rounded, as are the ears, and the limbs are long and slender. The claws differ from those of other cats in not being completely retractile, though the ligaments which should serve to draw them back are present. The upper sectorial tooth has the inner cusp quite rudimentary. The Woolly Cheetah (*F. lanea*), from Cape Colony, described by Mr. Sclater, may be only a variety. The Cheetah is partially domesticated, and is employed in the chase.

Cheilostomata, one of the three divisions of the Bryozoa belonging to the sub-class ECTOPROCTA. The main features of the order are these:—It has a calcareous or chitinous skeleton; the openings of the individual animals (zoœcia) that build up the colonies are lateral instead of terminal; the modified zoœcia, known as avicularia and vibracula, are here most developed; "oœcia" or marsupial pouches are present.

Cheiromys. [AYE-AYE.]

Cheironectes. [YAPOCK.]

Cheiroptera. [BAT.]

Cheke, SIR JOHN, was born in 1514 at Cambridge, where, at St. John's College, he obtained a fellowship. An enthusiastic advocate of Greek he, in 1540, when a regius professorship of that language was founded at Cambridge, was appointed to the chair. He introduced the mode of pronouncing Greek that still prevails in England. When Edward VI. ascended the throne he loaded Cheke, who had been his tutor, with honours. Of these, however, he was deprived on Mary's accession, and cast into the Tower. This led him to renounce the Protestantism he had previously professed, and he received back property equal in value to what he had been deprived of. The degradation, however, of having recanted preyed upon his mind, and he died in 1557 of grief. His claim to distinction is based on the impulse he gave to the revival of Greek learning.

Chekh, or CZECH, the national name of the westernmost branch of the Slav race, occupying the greater part of Bohemia and the whole of Moravia, and numbering (1890) 5,250,000. The Chekhs were noted in mediæval times for their extreme fanaticism, shown both in politics (thus, town councillors were hurled from the windows of the municipal palace, Prague), and especially in religion (*e.g.* the bodies of the slain were used as weapons by the survivors in the Hussite wars). Then followed a long period of apathy and debasement, during which they became almost Teutonised. But since the revival of the national spirit [BOHEMIA] a great change has taken place, and the Chekh element has now become one of the leading factors in the political and social life of the Austrian Empire. In appearance the Chekhs have been largely assimilated to their German neighbours, from whom they differ chiefly in their more prominent cheek-bones, more deep-set eyes, taller figures, and darker complexion. The brain pan also is much larger, and so far as this is a test of mental capacity the Chekhs rank amongst the most intellectual peoples of Europe. The language, which has been cultivated since the tenth century, forms with Polish the Slovak of North Hungary, and the Sorb (Wendish) of Lusatia, the western division of the Slavonic branch of the Aryan family. It has undergone great structural changes since the eighth century, from which period dates its oldest monuments, the famous Kralovdor and Zelenohora MSS., discovered in 1817. It possesses a copious literature, abounding in historical, religious, and poetical works, and is now freely used in scientific treatises. The so-called "Gothic" character, formerly used with little method, was set aside for the Roman in 1830, when the whole orthographic system was thoroughly reformed and greatly simplified.

Chelæ are the pincer-like claws of CRUSTACEA; in most cases, as in the crab and lobster, they are due to the terminal joint of the limb (or dactylopodite) acting upon a process of the adjoining segment.

Cheliceræ are the three-jointed pincer-like appendages found in ARACHNIDA. They are of interest from their position, as they are the only appendages in front of the mouth; they are, however, only secondarily præoral, and are homologous with the first pair of antennæ of those Crustacea that have two pairs of præoral appendages.

Chelmsford, a town of England, and county town of Essex, is situated at the junction of the Chelmer and the Cam. It is a well-built town, and chief among its buildings are the parish church, grammar school (founded by Edward VI.), shire hall, and corn exchange. Its trade is mainly in agricultural produce.

Chelmsford, THE RIGHT HON. FREDERIC THESIGER, BARON, was born in 1794. Entering the navy he quitted that service for the law, and was called to the bar in 1818. Acquiring a reputation on the home circuit, he was made a King's Counsel in 1834; in 1840 he entered Parliament, was knighted, and made Solicitor-General by Sir Robert Peel in 1844, and Attorney-General in 1845, and again in 1852, being lord chancellor under Lord Derby in 1858 and 1866. He died in 1878.

Chelonia, an order of Reptiles (q.v.), dating from the Trias, and containing the Turtles and Tortoises (*see* these words). The order, which is very widely distributed, includes marine, fresh-water, and terrestrial forms. The body is enclosed in a kind of case, consisting of two shields closely united at the edges, except at the openings for the head, limbs, and tail, which are more or less retractile. The upper shield is known as the carapace; the lower as the plastron. Four limbs are always present. There are no teeth, and the jaws are cased in horn so as to form a kind of beak.

Chelsea, a London suburb on the north bank of the Thames, famous for its hospital for old and disabled soldiers of the British army. This hospital was commenced in 1682 and completed in 1692. The funds for its maintenance are provided by Parliamentary grants. It is sometimes known as "Chelsea College," through occupying the site of a theological college opened by James I. There is also a Royal Military Asylum for Soldiers' Children, and a botanic garden, the bequest of Sir Hans Sloane, a former resident. Amongst celebrities that have lived here are Sir Thomas More, author of *Utopia*, Walpole, Swift, Steele, Leigh Hunt, George Eliot, and Carlyle. It is a parliamentary borough, and returns one member to Parliament.

Cheltenham, a town of England, in the county of Gloucester, is a watering-place of fashion, and stands on the Chelt, a tributary of the Severn. Beautifully situated in a valley, it was only a small village, when in 1716 mineral streams were discovered, which led to its rapid growth. Its waters are reputed good for liver ailments and dyspepsia. It has fine squares, gardens, pump-rooms, and places of amusement. It is also

distinguished as an educational centre, having besides private schools the large proprietary college, grammar school, ladies' college, and training college for teachers. Its parish church is of the fourteenth century, and among its other buildings the most notable are the Roman Catholic chapel, with a spire over 200 ft. high, the public library, and the corn exchange. It is a municipal and parliamentary borough, returning one member to Parliament.

Chelyuskin, CAPE, is the extreme north of Asia, and is on a peninsula of the same name. It is named from a Russian officer, who died here in 1742.

Chemistry may be defined as the science which treats of the composition of substances, and the changes produced in them by physical forces or by interaction with other substances.

The determination of the composition of substances or their *analysis* involves (1) a *qualitative analysis*, or the determination of the elements present, and (2) the *quantitative analysis*, a determination of the relative proportions of the respective components. These two together constitute the department of *analytical chemistry*. The branch of this department which deals with the analysis of metallic ores, or alloys, etc., is generally designated by a special name—*assaying*. The ascertainment of the relative quantities of the elements present in a body is not, however, sufficient for the complete knowledge of its composition. The absolute number of the atoms present, and their arrangement in the molecule—*constitution*—must also be determined. This is frequently only possible by a careful and arduous study of the physical properties of the substance, and the effects of its interaction with other compounds.

The study of the relations between the physical properties of a body and its chemical composition, together with the effects of physical forces, as heat, light, etc., on it, constitutes the branch of *physical chemistry* or *chemical physics*, and forms the border which joins, rather than separates, the two kindred sciences.

Until the commencement of the present century almost all the known compounds were those obtained either from minerals, or by appropriate methods from organic material. It was believed that between these two classes of bodies there was an essential difference, and that the latter owed their origin to a "vital force," and could not be prepared synthetically from mineral sources. Owing to this belief, Lemery first in 1675 divided the science into two branches, *Organic* and *Inorganic Chemistry*. The artificial preparation of urea by Wöhler in 1828 was quickly followed by the synthesis of many other so-called organic bodies, and effectually demonstrated the non-existence of any fundamental distinction between inorganic and organic compounds. All the latter, however, being found to contain carbon, and, as the known compounds of this element are excessively numerous, being greater in number than those of all the other known elements, the divisions are still retained, though the terms have lost their original significations. *Organic chemistry* may now be defined as the chemistry of the carbon compounds, *inorganic* being that of the compounds of the other elements. The branch of inorganic chemistry which treats of the composition, etc., of naturally occurring minerals, receives the title of *mineralogical chemistry*. The study of the chemical nature of substances entering into the constitution of the animal organism, and the chemical changes taking place during the life processes of animals, forms the domain of *physiological chemistry*. The investigation of the influence of soils, and manures, etc., of different compositions, upon vegetable life, and the chemical principles underlying the art of agriculture, are included in the province of *agricultural chemistry*. *Pharmaceutical chemistry* deals with the nature and mode of preparation of the various drugs, ointments, etc., employed for medicinal purposes. The science in its relations to the arts, manufactures, and industrial processes is embraced in the wide titles of *technical* and *applied chemistry*. Metallurgy might be regarded as a division of this science, but is generally treated as a separate branch of study. By the term "changes," as employed in chemistry, is understood chemical changes, *i.e.* alterations in the chemical nature or composition of the substance; in contradistinction to physical changes which only affect the state of the body, the composition remaining unaltered. Thus by the action of heat water becomes converted into steam, but this involves no alteration in the composition, as steam and water are identical in this respect, and on cooling water is again formed. If an electric current, however, be passed through it, water is decomposed and a mixture of two gases is obtained which do not on cooling recombine.

To represent the composition of bodies and the changes they undergo in different reactions, in a concise and simple fashion, chemists adopt a system of chemical nomenclature. That in use at the present time may be briefly described. Each element is represented by a *symbol*, which is generally the first letter, or characteristic letters, of its name, or in the case of the commoner and longer known elements, its Latin name. Thus oxygen is represented by the symbol O, silver by the symbol Ag. (Argentum). This symbol is used not only to represent the element qualitatively but also quantitatively, being used to signify a weight of the element proportional to its atomic weight. [ATOMIC THEORY.] By the combination of symbols *formulæ* are obtained representing compound substances, the number of such proportional weights being indicated by a small numeral placed at the right of, and below each symbol. Thus the formula of water is OH_2, *i.e.* it consists of 16 parts of oxygen and 2×1 parts of hydrogen by weight. The formula may also be taken as representing the *molecule* [ATOMIC THEORY] of the compound, and the formula OH_2 would then denote one molecule of water, *i.e.* one atom of oxygen combined with two atoms of hydrogen. A chemical action is represented by what is known as a *chemical equation*, in which the formulæ of the reacting substances

separated by the sign + are placed on the left side, and the formulæ of the resulting products on the right side, the two sides being joined by the sign of equality =. It is evidently a quantitative as well as a qualitative relation. Thus the equation

$$NaOH + HCl = NaCl + OH_2$$

states that by the interaction of 40 parts of caustic soda and 36·5 parts of hydrochloric acid, there result as products 58·5 parts of sodium chloride and 18 parts of water. The law of the *indestructibility of matter* serves as the basis of all chemical equations, in which the quantity of any particular element must be the same on each side. Frequently symbols are also used to denote groups of atoms which remain unchanged throughout many reactions. This is especially the case in organic chemistry, in order better to represent the constitution of substances, and to simplify the nomenclature. Thus the group of atoms C_2H_5 is represented by Et. and known as ethyl. These groups of atoms receive the name of *radicals*. As frequently two different substances may possess the same percentage, composition, and same number of atoms [ISOMERISM], formulæ are frequently employed which endeavour to represent the arrangement of the atoms. These are known as *constitutional formulæ*, and are of more frequent use in organic than in inorganic chemistry. The difference is seen in comparing the formulæ of two isomeric substances. Thus urea is denoted by $CO\begin{cases}NH_2,\\NH_2\end{cases}$ ammonium cyanate by NH_4CNO, in both of which the ordinary formula would be CON_2H_4.

A chemical change, in which two or more substances unite to form a new compound, is termed a *chemical combination*, for laws governing which *see* ATOMIC THEORY. The reverse reaction, where one compound is broken up into two or more substances, is called a *decomposition*, while those reactions, by far the most numerous, which involve the destruction of the reacting bodies with formation of new compounds are known as *double decompositions* or *metatheses*. Reactions in which more complex compounds are obtained from simpler are termed *synthetical*. When the reverse obtains the action is spoken of as *analytical*.

The word chemistry is derived from the Greek *chēmeia*, the original signification of which, however, is doubtful. It is, perhaps, however, identical with the Egyptian word *Chemi* = "Egypt." In such a case the meaning of chemistry was originally the Egyptian art. The Phœnicians, Egyptians, Greeks, and Romans possessed a crude knowledge of various chemical facts, chiefly metallurgical or technical, but the facts were not collected or correlated, neither did the ancients occupy themselves to any extent in chemical experiment. They were, however, prone to speculation, and from the Aristotelian doctrine of a primordial matter, of which all substances were but modifications, sprang the belief in the transmutation of metals. In this *alchemy* (q.v.) had its origin, and though the exertions of the alchemists, in their search for the philosopher's stone, were productive of a great increase in the number of chemical facts known, chemistry, as a science, cannot be said to have existed until the time of Boyle (1627–1691). During the early part of the sixteenth century the application of chemistry to medicine received an impetus through the work of Paracelsus (and afterwards of Van Helmont), who endeavoured to fuse medicine and chemistry into one branch of study. With Boyle begins the era of exact experimenting and of researches into the composition of substances. He, amongst other work, first clearly defined the meaning of the term *element*, and brought forward the law which bears his name. Contemporaneous was Mayow, and shortly afterwards Lemery advanced the science and first drew the distinction, now meaningless, between organic and inorganic chemistry. Becher and Stahl (1660–1734) promoted the further development, the latter advancing the theory of combustion known as the *Phlogiston Theory* [PHLOGISTON], which was for the next century generally accepted by scientists. Margraff first introduced the microscope as an aid in chemical investigations, and accomplished a large amount of useful work. The latter portion of the eighteenth century stands out as an epoch of brilliant chemical discoveries, chiefly through the exertions of Black, Priestley, Scheele, Lavoisier, and Cavendish. The latter first discovered the composition of water, and demonstrated the balance as the instrument *par excellence* of the chemist. Priestley, amongst much other work, discovered oxygen (1774), simultaneously found by Scheele, who added chlorine and manganese to the list of known elements. With Lavoisier dawns a new era in the history. His great work was the overthrow of the Phlogiston theory and establishment of the present theory of combustion and oxidation. The next great step was the enunciation of the Atomic theory by Dalton (1803), which was further developed by the labours of Davy, Gay-Lussac, and Berzelius. The former, also, is illustrious as the discoverer of the metals of the alkalis and the alkaline earths. Gay-Lussac originated the law associated with his name, and Berzelius first determined the atomic weights of a large number of the known elements. Avogadro (1811) brought forward "Avogadro's law," and about 1820 Dulong and Petit discovered the law connecting specific heat and atomic weight; and Mitscherlich enunciated the law of "Isomorphism" (q.v.). About 1861 the application of the spectroscope to chemical analysis by Bunsen and Kirchoff opened up an entirely new, wide, and fruitful field of investigation. From this time on the number of workers is legion. The discovery of the Periodic Law (q.v.) by Newlands (1864) and its further development by Lothar Meyer and Mendeleef must be regarded as the greatest step in modern times.

About 1820 organic chemistry, chiefly through the exertions of Dumas, Liebig, and Wöhler, began to make very rapid strides, and a great multiplicity of compounds were soon prepared and their compositions determined. The classification of these compounds was at first very unsatisfactory. Laurent and Gerhardt, by referring all to simpler substances as types, considerably simplified the science and materially advanced its growth. Their

work was further developed by Wurtz, Hoffmann, and Williamson. The discovery of benzene in coal-tar by Hoffmann and the preparation of the first aniline dye by Perkin (1856) was the foundation of the coal-tar industry, which, by the subsequent labours and researches of Perkin, Hoffmann, Lauth, Caro, Griers, and others, has extended to such an amazing extent. It is impossible, owing to the marvellous growth, to even briefly notice the later history, besides which the subsequent period is too near the present for us properly to appreciate the value of the various chemical discoveries. [*See* also ATOMIC THEORY, PERIODIC LAW, COMBUSTION, and other Chemical articles.]

Chemists, LAW RESPECTING. No person may assume the title of a chemist or druggist, or sell by retail (or compound) the poisons specified in certain statutes of the present reign, unless he has been examined and has obtained a certificate and been placed on the register of the Pharmaceutical Society of Great Britain. Chemists and druggists are not, however, subject to the espionage and fines for offences inflicted by the Apothecaries Act with reference to the buying, preparing compounds, dispensing and vending of drugs, medicines, and medicinable compounds wholesale and retail. *See* the statutes 55 George III., c. 194, sec. 28; 15 and 16 Vict., c. 56; 31 and 32 Vict., c. 121; and 32 and 33 Vict., c. 117.

Chemnitz, a town of Saxony, situated on a river of the same name at the foot of the Erzgebiege. It is the centre of the cotton-weaving industry in the kingdom, and is known as the "Saxon Manchester." It has also manufactures of woollens, silks, and other textile fabrics, as well as factories for making machinery.

Chemnitz, MARTIN, theologian, was born in 1522 at Treuenbrietzen, Brandenburg. He was very poor, and while a student had to leave his studies to work for food. At length, in 1550, he received the appointment of librarian to Duke Albert of Prussia at Königsberg. In 1553 he had to leave in consequence of his antagonism to Osiander, and went to Wittenberg. Here he lectured on the *Loci Communes* of Melanchthon, the lectures being published under the title of *Loci Theologi* after his death. He then repaired to Brunswick, where he laboured as a preacher, and died in 1586. Among his works are *Examen Consilii Tridentini*, and *Corpus Doctrinæ Pruthenicum*, the joint work of Chemnitz and Morlin, and subsequently the standard theological work of orthodox Lutheranism.

Chemosh, the national god of the Moabites, who are hence (Numbers xxi. 29, Jeremiah xlviii. 46) called "the people of Chemosh." Solomon even "built an high place for Chemosh, the abomination of Moab, in the hill that is before Jerusalem."

Chemulpo, a town of Corea on the west coast, is one of the three treaty-ports of Corea. Though its harbour accommodation is not good, its trade has continued to increase since it was opened up to foreign commerce in 1883. It imports European and American manufactures, and among its exports are beans, ginseng, etc.

Chenab, one of the five rivers that give its name to the Punjab, rises in the Himalayas, and during its course of 750 miles receives the Tavi, Jhelum, and Ravi. Under the name of the Trimab it unites with the Sutlej; at Wazirabad it is spanned by an iron railway bridge more than a mile long.

Chenery, Thomas, editor of the *Times* newspaper, was born in 1826 at Barbadoes. Educated at Eton and Cambridge, he was called to the bar. He went as correspondent for the *Times* to Constantinople in the time of the Crimean war, and afterwards became attached to the staff until 1877, when he became editor. He was a thorough Hebrew and Arabic scholar, and was one of the Old Testament revisers. He died in 1884.

Chénier, MARIE-ANDRÉ, poet, was born in 1762 at Constantinople, where his father was French consul-general. After being educated at the Collège de Navarre, Paris, he joined the army, which, however, he soon left and devoted himself to literary pursuits. He rather favoured the revolution in its earlier stages, but, shocked at the excesses which it developed, he denounced it in pamphlets, and was thrown into the prison of Saint Lazare. After six months' incarceration he was executed July 25, 1794. His poems, through his being cut off at so early an age, are necessarily not considerable in number, but he is reckoned to be one of the French leaders of song in the eighteenth century. Among his best pieces are *La Jeune Captive*, *Le Jeune Malade*, and *Versailles*.

Chenomorphæ, in Huxley's classification, a group of Birds, containing the Ducks and Geese (*see* these words).

Chenonceaux, a celebrated castle near Amboise, a French town in the department of Indre-et-Loire, is built partly on a bridge crossing the river Cher, and was commenced in 1524 by Chancellor Bohier and completed by Catharine de Medici. It afterwards became the property of the Condés. It is still in a good state of preservation, and contains many valuable and interesting relics.

Cheops, a king of Egypt, celebrated as the builder of the largest of the pyramids. He flourished about 3,000 B.C.

Chepstow, a town and port of England in Monmouthshire, is situated on the right bank of the Wye, which is crossed here by Brunel's tubular railway bridge. The tides are higher here than in any other part of Britain, and allow ships of considerable burden to go right up to Chepstow. The old castle is referred to the time of the Conqueror. Among the industries is shipbuilding, and among the exports are cider and mill-stones.

Cher, a river of Central France, with a northerly and north-westerly course of about 200 miles, falls into the Loire 12 miles below Tours. The department covers an area of 2,770 square miles. Its surface is for the most part flat, and agriculture and cattle rearing are extensively followed. Among

its manufactures are woollens, cutlery, and porcelain. There are also iron and coal mines and marble quarries. Its capital is Bourges.

Cherbourg, a town, fortress, and first-class naval arsenal in the department of Manche, lies a few miles to the eastward of Cape La Hague. The commencement of its development as a modern naval fortress took place in 1803, under Napoléon I., and the works were not finished until 1858. The place lies at the bottom of a broad bay, across which stretches a magnificent breakwater, with four heavily armed forts upon it. Between the western end of the breakwater and the shore lies a detached fort, and at the extremity of each arm of the bay is another powerful work. There are three fine basins for ships, and eight large dry docks. On the land side the place is fortified as strongly as towards the sea. It is in charge of a Préfet Maritime, who is usually a vice-admiral, and who is in command not only of Cherbourg but also of Dunkerque and Le Havre. Cherbourg was in 1758 seized and destroyed by the English. It is the *Cæsaris Burgum* of the Romans.

Cherbuliez, ABRAHAM, a prosperous Geneva bookseller, was the father of a distinguished family, of which the following were members. ANDRÉ, eldest son of the preceding, was born in 1795. Professor at the Geneva Academy, he wrote *De Libro Job*, and an *Essai sur la Satire Latine*. He died in 1874. ANTOINE ELESÉE, second son of Abraham, was born in 1797. Professor of political economy at Geneva, he afterwards distinguished himself by his opposition to Proudhon and the Socialists. He wrote *De la Démocratie en Suisse*, *Études sur les causes de la Misère*, *Précis de la Science Economique*. He died in 1869. JOEL, third son of Abraham, and his father's successor in the business, was born in 1806. He wrote a clever skit on Victor Hugo's views of capital punishment, *Le Lendemain du dernier Jour d'un Condamné*, and was editor of the *Revue Critique*. He died in 1870. CHARLES VICTOR, the son of André, was born in 1832 at Geneva. In 1864 he removed from Geneva, where he was a teacher, to Paris. Here he began to acquire a reputation as a novelist, and wrote on political questions to the various journals. His works are numerous, and among them may be mentioned *Le Comte Kostia*, *Le Prince Vitale*, *Paul Méré*, *Le Romanee d'une honnête femme*, *Le Grand Œuvre*, *L'aventure de Ladislas Bolski*, *Le Fiancé de Mdlle. de St. Maur*, *L'Idée de Jean Teterol*, *Noirs et Rouges*, *La Femme du Choquard*, *Olivier Margaut*, *La Bête*, etc.

Cheribon, a seaport town of Java on its north coast, and capital of the province of the same name, is the residence of a Dutch governor and has a fort. Its trade in coffee, indigo, and teak is considerable.

Cherokees, a large North American nation belonging to the Appalachian group, who call themselves Tsallakies, with two branches, the Ottaré or "Highlanders," and Ayraté or "Lowlanders," at one time jointly occupying the Appomattox Basin, Virginia. Driven thence southwards, they formed, at the close of the last century, a widespread confederation in Kentucky, Tennessee, and a large part of both Carolinas and Georgia. Here they developed a social and political system of a high order, completely abandoning the chase for agriculture, introducing orderly self-government, with national assemblies and laws based on national customs. They also applied themselves to literature, and in 1824 the Cherokee George Guest (Segwoya) invented a complete syllabarium of 78 signs, which is perfectly suited to express the sounds of the Cherokee language, and with slight improvements has since been used for that purpose. Then came fresh collisions with the whites, and the final removal (1835) of the whole nation to Indian Territory, where they now occupy two well-cultivated and well-stocked Reserves, and where they have continued to govern themselves with representative institutions (an upper and a lower house), a written constitution, a legal code, and monogamy. Of all North American aborigines the Cherokees have shown the greatest capacity for adapting themselves to European culture, and in their new settlements they have gradually increased from 14,000 in 1864 to 16,000 in 1872, and over 20,000 in 1890. Physically, they are typical American Indians, very tall, with very long, black hair, large nose, small black eyes, and light, somewhat olive, complexions. The language is highly polysynthetic, but otherwise unrelated to any other American idiom. *See* W. Bartram, *Observations on the Creeks and Cherokee Indians*, in Transactions of the American Ethnological Society, 1853; E. Ludwig, *The Literature of American Aboriginal Languages*, London, 1858.

Cherry, the fruit of the sub-genus *Cerasus* of the genus *Prunus*, a group of drupaceous trees. *Cerasus* is distinguished by leaves folded in halves in the bud, and a globular fruit with a polished surface and a smooth, roundish stone. Many species grow to a large size, and produce valuable wood for cabinetmakers and musical-instrument makers; the bark is astringent, and there are traces of prussic acid in the leaves as well as in the kernels. Branches of *C. Mahaleb* are made into pipe-stems in Austria, and the bark of *C. virginiana* is a febrifuge. A gum exudes from the trees, which is used by hatters. There are three British species—*C. Padus*, the bird-cherry, or hagberry of Scotland, with flowers in racemes; *C. avium*, the gean, a small tree with few or no suckers, flowers in umbels, and the flesh of the fruit adherent to the stone; and *C. vulgaris*, the dwarf cherry, a shrub with suckers, flowers in umbels, and a readily separable stone. The two latter are probably the originals of all the cultivated varieties. Some new cultivated varieties seem to have been introduced into Italy by Lucullus after his defeat of Mithridates, 68 B.C., and the Kentish cherry or cerise de Montmorency and the Bigarreau or Spanish cherry seem to have been brought to England from Flanders by Richard Haines, printer to Henry VIII. The Kentish are chiefly used for pies; the Morella, a bitter variety, for preserving in brandy, and the May Duke as a dessert fruit. The German Kirschwasser, the Italian Maraschino, and

the Ratafia of Grenoble are liqueurs distilled from the pulp, kernels, and leaves of cherries, mixed with other ingredients.

Cherry Finch, a dealers' name for *Estrelda modesta*, a small Australian bird, of sober plumage, with the crown of a plum or deep cherry colour.

Cherry Laurel. [LAUREL.]

Cherso, an island of Austro-Hungary, lies in the Gulf of Quarnero in the Adriatic Sea. Covering an area of 127 square miles, it yields wine, olives, and various fruits. It has extensive forests. It is united with a neighbouring island, Lussin, by means of a bridge. Its capital, Cherso, has good harbour accommodation and a cathedral.

Chersonesus, the Greek name for a peninsula, and anciently applied to several peninsulas of Europe and Asia, such as *Chersonesus Aurea* (Malacca), *C. Cimbrica* (Jutland), *C. Thracica* (Gallipoli), *C. Taurica* (Crimea), *C. Novantum* (Rhinus).

Chert, an impure kind of flint, varying in colour, but generally black or bluish grey, occurring in nodules, as in the Portland beds, or in layers, as in the Greensand, and breaking with a flat, splintery fracture. Microscopic examination shows it to be often largely composed of much altered remains of Radiolaria (q.v.). In the Carboniferous Limestone are beds and nodules of a very flint-like black chert known as *phthanite*, which contains sponge-spicules and siliceous replacements of calcareous foraminifers and crinoids.

Chertsey, a town of England in the county of Surrey, is situated on the right bank of the Thames. It grew out of a monastery established in 666. Its leading industry is market gardening, and it trades in malt and flour. Near the town, on St. Anne's Hill, Fox used to live, and in a house now marked with an inscription Cowley spent the declining years of his life.

Cherubini, MARIA LUIGI CARLO ZENOBIO SALVATORE, composer, was born in 1760 at Florence. He was a pupil of the famous Sarti, whom he accompanied in 1779 to Milan, and became grounded in the old Italian contrapuntal style. Between 1780 and 1788 he composed eleven operas, amongst them being his *Iphigenia in Aulis*, for a while his masterpiece, and only superseded by his later production, *Les deux Journées*, known in England as *The Water Carrier*. In 1784 he came to London, settling in the following year in Paris, where he remained during the revolution, the consulate, and the empire, and again under the restoration. In Paris he held an appointment in connection with the National School of Music, which attained under his guidance a high standard of excellence. While Cherubini was a director of the Conservatoire, Berlioz was a pupil there. Besides the pieces mentioned, the only other of Cherubini's known to English audiences is the *Medea*. He died in 1842.

Chervil (*Anthriscus cerefolium*), a potherb, cultivated by Gerard in Holborn in 1590, occurring now as an escape from cultivation in England, and largely grown as a seasoning for soup and for salad on the Continent. It is an umbelliferous plant with a stem hairy above the nodes, fine-divided leaves, sessile umbels of minute flowers, and smooth fruit. There is a curled-leaved variety, which is used as a garnish. A related British species, *A. vulgaris*, with smooth stem, stalked umbels, and hairy fruit, is poisonous. The parsnip chervil, *A. bulbosus*, a native of France, has a nutty esculent root.

Chesapeake Bay, in Maryland and Virginia, is the largest inlet from the Atlantic into the coast line of the United States. It is nearly 200 miles long and from 4 to 40 miles broad. Its entrance between Cape Charles on the north and Cape Henry on the south is about 16 miles wide. Around its shores are numerous commodious harbours, and into it flow the Susquehanna, Potomac, and James rivers.

Cheselden, WILLIAM, surgeon, was born in 1688, near Melton-Mowbray. After studying, he, in 1711, began to lecture in London on anatomy, and in the following year was elected a Fellow of the Royal Society. As a hospital surgeon he gained a reputation for his operations for stone, and in 1728 operated successfully on a man born blind. Among his works are *Anatomy of the Human Body*, for many years a text-book; and *Anatomy of the Bones*, with plates, and brief explanatory notes. He died in 1752 at Bath.

Cheshire, a county in England, on the W. seaboard, is skirted on the N. by the Mersey, which separates it from Lancashire. Covering an area of 1,100 square miles, of which fully three-fourths is under cultivation, it provides some of the finest pasture land in England, and the staple produce of the Cheshire farmers is consequently cheese. A considerable acreage is devoted to market gardening, and the markets of Liverpool, Manchester, and other large centres are supplied from here. Rock-salt and coal are extensively worked. There are also brine springs from which salt is made in large quantities. Among other minerals found are lead, copper, firestone, limestone, millstone, and marl. There are extensive and varied manufactures in the large towns of the county, which embrace Birkenhead, Congleton, Chester (the capital), Crewe, Macclesfield, Stalybridge, and Stockport. Trade is facilitated by the numerous railways that traverse the county, and a splendid system of canals, among which is the Manchester Ship Canal for the greater part of the distance it extends. Besides the Mersey, it has also the navigable rivers Dee and Weaver, the former on the W. and the latter in the E. of the county. It contains eight parliamentary divisions, each returning one member, and was erected by William the Conqueror into a county palatine. It did not send representatives to the English Parliament till 1549.

Chesil Beach, a remarkable shingle bank, about fifteen miles long, and from 170 to 200 yards wide, between Burton Bradstock and Portland in Dorsetshire. Its eastern half is separated from the

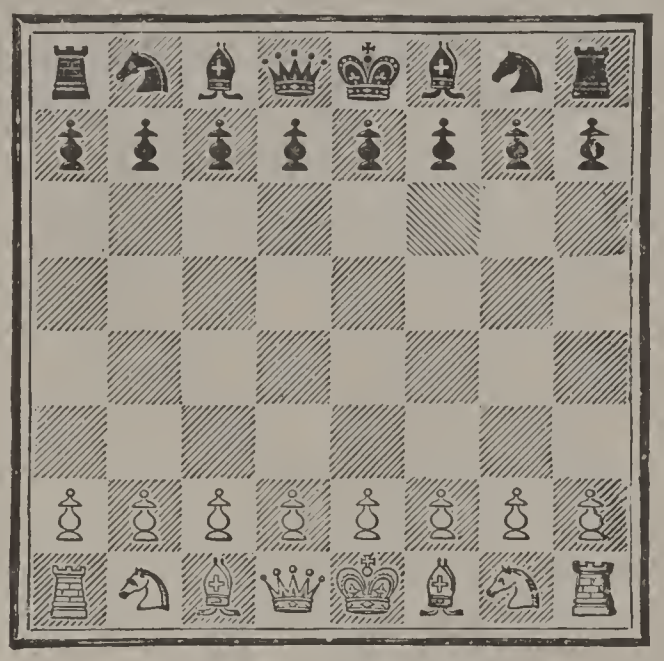
shore by a channel known as the Fleet. The pebbles consist of flint, chert, granite, Budleigh Salterton quartzite, pebbles, and other materials all derived from the west, and they increase markedly in size eastward. It seems to have originated as an ordinary shingle beach, the Isle of Portland causing it by acting as a gigantic natural groyne; to have deflected several small streams eastwards, as do other shingle beaches at the mouths of the Exe and the Christchurch Avon, for instance; and to have become separated from the mainland by these streams swollen by tidal action and wearing back the low oolite cliffs.

Chesney, Francis Rawdon, explorer, was born in 1789 at Annalong, county Down. After a period at Woolwich, he was in 1805 gazetted to the Royal Artillery. Visiting Turkey in 1829, he surveyed the Isthmus of Suez, and proved the canal to be a practicable undertaking. He next sought to discover an alternative route to India by way of Syria and the Euphrates, and four different times journeyed to the East for this purpose. He was subsidised by a grant of £20,000 by the English Government, but the opposition of Russia interfered with his success. In 1837 he received the Geographical Society's gold medal, and received the honorary degree of D.C.L. from the University of Oxford. He wrote *Past and Present State of Firearms*, *Russo-Turkish Campaign of* 1828–9, *Narrative of the Euphrates Expedition.* He died in 1872 at Mourne.

Chess is a game of skill played by two persons on a board of sixty-four squares, coloured alternately black and white. Though it is admittedly one of the most ingenious and fascinating of pastimes, both its origin and development are shrouded in mystery, the solution of which has long been abandoned by historians of the game. Whether it was invented by the Chinese or the Hindoos, the Persians or the Greeks, whether it was one of Solomon's diversions, or whether the Greeks played it when beleaguering Troy, are questions beyond settlement, even if they were worth settling. Still, we may take it as practically certain that chess had its beginnings in the East, and was played in Hindostan probably 1,500 years ago. Many centuries later the Moors brought it into Spain in one form or another, whence it passed to France. England, it is supposed, obtained it from the Norsemen, and chessmen in use by the Anglo-Saxons are still extant. The game now played in Europe differs in many respects from that of either ancients or moderns in the East. In Japan, at the present day, the board consists of eighty-one squares; in China the squares are of one colour, and the pieces, sixteen in number, are arranged in three lines, a river, or supposed river, dividing the hostile forces, which can only cross the dividing line under certain conditions and restrictions.

In the European game sixteen pieces are used by each player, one set black, the other white, which are placed at the beginning of the game on the first two lines of squares at both ends of the board, the players having each a white corner on his right hand. Of the sixteen chessmen eight are termed "pieces," in contradistinction to the other eight which are known as "pawns." The pieces occupy the first line of squares next the side of the board, and are king with his bishop, knight and rook (or castle), and queen with her bishop, knight and rook, the bishop being placed next the queen and king respectively, the knight next the bishop, and the rook on the flank. The king and queen stand together at the opening of the game, and the queen is always on a square of her own colour.

As for the moves, the pawn marches straight ahead, one square at a time, but at the first move



DIACRAM OF CHESS BOARD.

has the privilege of advancing either one or two squares. In capturing, however, the pawn moves diagonally either to the right or left. It never goes backwards, but when it has forced its way to the eighth square it becomes a piece, with all the powers of a piece. The player has the option of exchanging this advanced pawn for a knight, bishop, or rook, but the queen, as the most formidable fighting piece, is usually selected—hence the phrase "queening a pawn." There is another peculiarity of the pawn, known as capturing *en passant* (in passing). If a pawn has advanced to the fifth square, and an adverse pawn on either of the adjoining lines, not having moved before, advances two squares, it can be captured by the pawn on the fifth square as though it had moved only one step forward.

The king can only move one square at a time, but in any direction. Once in a game, however, he makes a double move, and this is termed "castling." He can castle on his own side when the bishop and knight have been moved out, and neither he nor the rook has been touched, by moving to the knight's square, the rook being transferred to the bishop's. He can also castle on the queen's side, provided the queen, bishop, and knight are elsewhere than on their respective squares. In this case the king moves to the queen's bishop's square, the rook being brought over to the queen's square. As in castling on the king's side, so on the queen's,

neither rook nor king must have moved previous to the operation. Castling cannot take place if in the act the king crosses a square commanded by a hostile piece, or if the king is in check.

The queen is the most powerful of all the pieces. Placed near the centre of the board, she commands twenty-seven squares, while the rook only commands fourteen, the bishop thirteen, the king eight, and the knight eight. She can move in any direction backwards, forwards, diagonally, or sidewise.

The rook moves in straight lines up or down or horizontally across the board.

The bishop moves diagonally only, and always remains on the colour of its original square.

The knight has a rather eccentric action. It moves two squares at a time, but always from black to white or vice-versa. It is the only piece which can leap over a friend or a foe, and the only one where check of the king cannot be met by interposition. It must either be taken or the king must move. The move with the knight may most readily be understood by putting the piece two squares backwards or forwards, and then one to the right or left.

The object of the game is to drive the adversary's king into a position where he is checked by an opposing piece or pieces (which he cannot take or intercept), and from which he cannot move. He is never really captured, that is, he is never removed from the board, but he is shut in so that he is forced, so to speak, to surrender. This is what is termed "checkmate," and to accomplish this the efforts of the players are directed from the first moves of the game. The different lines of attack are known as "gambits" or "openings," a gambit being the sacrifice of a pawn or piece early in the game by a player who hopes to obtain a strong position thereby. The ordinary "king's gambit" turns upon the sacrifice of the king's bishop's pawn, the "Muzio gambit" involves the sacrifice of a knight, the "Evans' gambit" entails the abandonment of the queen's knight's pawn, and so forth. As there are forty or fifty methods of opening a game, space forbids us even to enumerate them, far less describe them. All games, of course, are not gambits. There are close games in which neither player offers a sacrifice. There are counter gambits where a sacrifice is offered by both players, and there are games known as "defences," where the tactics of the second player give the name to the opening. Any shilling handbook will afford the student all the information he requires on this part of the subject, and also upon the best methods of playing the end game. The beginner should carefully study the openings, otherwise he is likely to be quickly beaten by an opponent who is perhaps his inferior in real strength, but who has given some attention to the gambits. With regard to draws, a game is drawn when towards the close both sides are so equal that a win is impossible. If two kings are alone on the board, of course there must be a draw, since a king cannot even give check, or if there is a knight and king against a king, or two knights and a king against a king, or a bishop and king against a king. If a player also persists in repeated checks, from which the king cannot escape, the game must be drawn. The same result follows when a king and his pieces are in such a position that they cannot move without exposing the king to check. This is termed "stalemate." It is unnecessary to give detailed instructions as to how a game should be played by a beginner. The principles are simple enough, and the putting of them into practice is a matter of time, care, and observation. But the learner should avoid giving useless checks; he should have a well-defined purpose in view; he should be careful in accepting tempting offers of pawns or pieces; he should watch his adversary's game as carefully as his own; and he should not bring his queen too early into the field, unless, indeed, his opponent is a novice, and then he might perform what is known as fool's mate or scholar's mate on him thus:

White.

1. King's pawn to king's 4.
2. King's bishop to queen's bishop 4.
3. Queen to king's rook 5.
4. Queen takes bishop's pawn (mate).

Black.

1. King's pawn to king's 4.
2. King's bishop to queen's bishop 4.
3. King's knight to king's bishop 3.

Here the second player, at his third move, instead of defending his bishop's pawn, attacks his opponent's queen and is at once mated. It may be noted here that during the last thirty years chess-players have adopted a much more cautious style of play. When Paul Morphy came from America in 1858, and vanquished every European player of eminence who was pitted against him, he offered and accepted gambits with almost reckless audacity. Nowadays in a match gambits are seldom offered. The one which has been most thoroughly analysed, the Evans, is perhaps the one where the theoretical disadvantage is smallest. The pawn which is given up is not required for the defence of the king, like the king's bishop's pawn in the Allgaier or the knight's gambit, and the disadvantages are not felt till near the middle of the game. Hence a bold player will sometimes offer it in a match. But the more daring forms of gambit such as the Allgaier and the Muzio are too risky to be tried in serious play. At the present time the Ruy Lopez is one of the most favourite forms of attack, and one that is very difficult to parry. The queen's gambit (sacrificing the queen's pawn on second move) would be a good attack, but it is generally declined. The Steinitz gambit, which involves the moving out of the king under check of the queen, is full of danger for the first player if properly met. Steinitz himself, though he has given his name to a risky game, has done much to introduce a cautious style of play.

The laws of chess as sanctioned by the London Tournament in 1883 are rather voluminous, but the more important of them may be briefly summarised:—If the board or pieces have been misplaced at the beginning of a game, or if a piece is left off the board, they can be adjusted if no more than four moves have been played by each player. If it is a player's turn to move and he

touches a piece or pawn he must move it, unless on touching he says "j'adoube" (I adjust) or words to that effect. Should a player touch an adversary's piece without saying "j'adoube," the adversary may compel him to take it unless it cannot legally be taken, and then he may oblige him to move his king; if the king cannot be moved there is no penalty. There are also penalties in the case of a player moving out of his turn, or capturing one of his own pieces. If a piece that cannot be moved without exposing the king to check be touched, it must be replaced and the king moved. If the king cannot be moved there is no penalty. If a player's king has been in check without being observed, he must take back his last move and free his king from the check; if all the moves made subsequent to the check be known they must be taken back. If a player attack a king without saying check, his opponent is not bound to take notice of it. Should a player say "check" without giving it, and the adversary move his king or interpose, he may retract the move. If towards the close of a game a player has a decided superiority of force, such as king and two bishops against a king, the adversary can claim a draw, unless the game is concluded in fifty moves. The giver of odds is entitled to the first move. Though the "laws" of the game are strictly enforced in tournaments and matches, they are little observed in ordinary play, where there is a good deal of give and take. The touch and move rule, however, should always be observed, even in friendly games. One of the best and easiest methods of learning chess is to play one good game such as the following, which has the double advantage of being a fine specimen of Blackburne's blindfold play, and illustrating also a brilliant yet sound combination. (*See* White's 13th move.) The game is one of those played blindfold and simultaneously at the City of London Chess Club on the 5th of October, 1891.

White.	Black.
Mr. Blackburne.	Amateur.
1 P to K 4	1 P to K 4
2 P to K B 4	2 B to B 4
3 Kt to Q B 3	3 Kt to Q B 3
4 Kt to B 3	4 P takes P
5 P to Q 4	5 B to Kt 5
6 B takes P	6 P to Q 4
7 P to K 5	7 B takes Kt ch
8 P takes B	8 B to K 3
9 B to Q 3	9 P to K R 3
10 Castles	10 K Kt to K 2
11 R to Kt sq	11 P to Q Kt 3
12 Q to Q 2	12 Castles
13 B takes P	13 P takes B
14 Q takes P	14 Kt to Kt 3
15 Kt to Kt 5	15 R to K sq
16 R takes P	16 B takes R
17 Q to R 7 ch	17 K to B sq
18 Q takes B mate	

Chessylite ($2\,CuCO_3 + CuH_2O_2$), a carbonate and hydrate of copper, closely related in composition to malachite, with which it occurs; but differing in its deep blue colour, whence it is also known as *azurite*. It crystallises in the oblique system, and is named from its occurrence at Chessy, near Lyons.

Chest. The cavity of the chest or *thorax* is bounded posteriorly by the spinal column and anteriorly by the sternum, is walled in by the ribs and intercostal muscles laterally, and is separated below from the cavity of the abdomen by the diaphragm. Above, the circumference of the chest rapidly narrows, so that the superior aperture of the thoracic cavity is of less dimensions than a transverse section at any lower level. Through this aperture pass the trachea or windpipe and œsophagus, as well as important blood-vessels and nerves. A transverse section at the level of the lower part of the sternum is roughly elliptical in shape. A series of measurements of the healthy adult male chest taken at this level gives, as average results, the following figures:—Circumference, 35 inches; antero-posterior diameter, 9 inches; transverse diameter, 11 inches. The chest is never quite symmetrical, the right half being usually somewhat larger than the left, in association with the greater development of muscles on the right side of the body. Certain deviations from the normal shape of the chest are met with in disease. The flat chest and the pterygoid chest are often found in association with phthisis (consumption). The pigeon breast results usually from prolonged chest mischief in childhood, for oft-repeated paroxysms of coughing, if they occur at a time when the ribs have not acquired the relative inflexibility of the adult condition, cause a straightening of the anterior part of the ribs, and thrust the sternum forward, leading to the shape of chest which has been compared to that which obtains in the bird. A transverse furrow known as Harrison's sulcus is also often produced in those who as children had "delicate chests"; the most common deformity of the chest is, however, the rickety chest. [Rickets.] Curvature of the spine produces, of course, a deviation from the natural shape of the chest. In the thoracic cavity are contained the lungs and the heart with the vessels entering and leaving it. The œsophagus traverses the whole length of the chest to leave it below by an aperture in the diaphragm; and by its side through the greater part of its course runs the thoracic duct. The spaces lying in front of and behind the heart, and unoccupied by the lungs, are called the anterior and posterior mediastina respectively. Diseases of the chest are dealt with under the special articles on Heart, Aorta, Lungs, etc.

Chester. 1. A city of England, capital of the county of Cheshire, situated on the Dee, 16 miles S.E. of Liverpool. It is the ancient *Deva* or *Deva Castra*, and stands on a rocky elevation enclosed in great part by massive walls, which, being seven or eight feet thick, make an agreeable promenade. The principal thoroughfares, which diverge to the cardinal points of the compass, still remain as the Romans cut them out of the rock, and have their carriage ways several feet below the level of the adjacent houses. Over the shops for foot-passengers are piazzas or "rows," attained by flights of steps at convenient distances. There are also many sixteenth-century timber houses, and even the

modern buildings are put up in the same style, thus giving the city an antique appearance. Its old and interesting cathedral was recently restored under the guidance of Sir Gilbert Scott, and the see of Chester dates from the time of Henry VIII. Among its other ecclesiastical buildings are St. John's church, a fine specimen of Saxon architecture, and Trinity church, in which are the tombs of the poet Parnell and Matthew Henry. Other noteworthy edifices are the town-hall, the post-office, the public library, and the music-hall. It is well supplied with railway facilities, and has an additional means of transit in the Dee. Amongst its industries are lead manufactures, boot and shoe making, chemical works, iron shipbuilding yards, and iron foundries. It is a county in itself, and returns one member to Parliament. It is rich in historical associations from the time of the Roman occupation to the struggles between England and Wales. It also ardently espoused the cause of the king against the Parliamentarians in the seventeenth century, when the inhabitants were starved into surrender. 2. A city of the United States, in Delaware county, Pennsylvania, situated on the Delaware river, and is one of the oldest towns in the state. Founded by the Swedes in 1643, it was originally named Upland. It has extensive ship-building yards, and manufactures of cottons, woollens, etc.

Chester, Joseph Lemuel, genealogist, was born in 1821 in Norwich, Conn., U.S.A. In 1858 he came to England and edited the *Registers of Westminster*. Extracts that he made from the Bishop of London's register are published under the title *London Marriage Licences*. He received the degree of D.C.L. from Oxford. He died in 1882 in London.

Chesterfield, a town of England, in Derbyshire, is situated on a small stream, the Rother, and is connected with the Trent by canal. It is irregularly built, and All Saints' church has a spire 228 ft. high and 6 ft. off the perpendicular. Among its manufactures are ginghams, lace, earthenware, and machinery. There are also collieries, iron mines, and blast furnaces in the neighbourhood. Chesterfield gives its name to a parliamentary division of the county.

Chesterfield, Philip Dormer Stanhope, Earl of, statesman, was born in London in 1694. Studying at Cambridge, he was returned to Parliament in 1716 for St. Germains, Cornwall, which he represented till 1726, when he became Earl of Chesterfield. In 1728 ambassador to Holland, 1744 Lord-Lieutenant of Ireland, and 1746 Secretary of State; he was in 1748 obliged to retire from public life on the ground of ill-health. He gained some reputation as an author by his *Letters to his Son*, and his essays. He died in 1773.

Chestnut, the fruit or nut of *Castanea vulgaris*, a fine tree belonging to the order *Quercineæ*. The tree may reach a large size, and has deeply furrowed bark and large glossy serrate but simple leaves in tufts, which turn yellow in autumn. Its flowers are in long pendulous catkins, those near the apex being staminate. The pistillate flowers are grouped, from two to five together, within a densely spinous cupule which splits into four valves. The dark brown nuts are surmounted by the remains of the perianth, being "inferior" fruits. In a wild state two or three kernels or seeds, separated by a membrane, are contained in each nut; but the Lyons marron, the most valued cultivated race, contains only one. The tree is native from Portugal to the Caspian and in Algeria, and is represented by allied forms in Japan and temperate North America, flourishing in the Alps and Pyrenees at 2,500 to 2,800 feet above sea-level. Though the Tortworth chestnut in Gloucestershire, now over 12 feet in diameter, was a large tree in the reign of Stephen, the species is not indigenous to Britain. Its timber resembles oak, but is softer and more brittle. The roofs of many old buildings, including Westminster Abbey and the Louvre, once thought to be chestnut, are now known to be oak. When felled the tree sends up abundant coppice-shoots, furnishing good cover for game and valued also for hop-poles. The fruit ripens over about the same area as does that of the vine; but the Downton variety, with short spines, the Devonshire, and the Prolific do so in this climate. The large cotyledons of the exalbuminous seeds contain but little oil, and are so farinaceous and so important as a staple food in Sicily and some other parts of Southern Europe as to be fairly reckoned among bread stuffs. The chestnuts eaten in England come mainly from Spain, Italy, Belgium, and Holland.

Chestnut, Horse (*Æsculus Hippocastanum*), a tree, frequently 50 or 60 feet high, belonging to the order *Sapindaceæ*, a native of Asia, introduced into Europe about the middle of the 16th century. It has a smooth stem with soft, white, valueless, rapidly-growing wood, thick branches, and very large gummy terminal buds. The leaves are in opposite, decussate pairs, with stalks nearly a foot long, and seven large leaflets arranged palmately. These are remarkable for rising from a pendulous to a horizontal position. The flowers are in large conical clusters, technically known as racemes of cicinnal cymes and are asymmetric, having five sepals, five petals, seven stamens, and three united carpels. The petals are white with pink and yellow honey-guides at their bases. Only the lower flowers of a cluster have an ovary, and this forms a fleshy dehiscent three-chambered fruit set with short scattered prickles. Each chamber contains two ovules, but the seeds are fewer in number. They have a polished brown testa with a large, rough, circular hilum, and so resemble the fruits of the true chestnut (q.v.), a tree of an entirely distinct group. The seeds are exalbuminous, and the cotyledons are farinaceous but bitter, and are, therefore, but rarely used as human food. They are eaten by deer, goats, and sheep, and are said to be good for cattle with coughs. They produce a slightly soapy lather with water. The scarlet horse-chestnut, often grown for ornament, belongs to the genus *Paria*, which differs in

being smooth-fruited. Allied species are known in America as Buckeyes.

Chettle, HENRY, dramatist, flourished in the latter half of the sixteenth century. Apprenticed to a stationer, he first came into public notice as editor of Green's *Groat's Worth of Wit* (1592). He appears besides to have written thirteen plays, and to have been joint author of thirty-five others, among the latter *Patient Grisel* and *Jane Shore*. He was described as one of "the best for comedy among us;" yet he was never otherwise than pecuniarily embarrassed, and for the sum of £3 signed a bond in 1602 to write for the Earl of Nottingham's players alone. He died about 1607.

Chevalier, in its primary sense, has the same meaning as its doublet, cavalier, *i.e.* horseman; in its secondary sense it was a title of French nobility, generally applied to the younger sons of nobles, who sometimes, put to the shifts to which younger sons are liable, did not perhaps dignify the name. Hence, possibly, the application of the name of *chevalier d'industrie* to a black-leg, a man living by his wits. The Chevalier Bayard is well-known to all, and readers of French literature may be acquainted with the Chevalier Faublas. The name was also applied to the son and grandson of James II. of England.

Chevalier, MICHEL, economist, was born in 1806 at Limoges. He joined the St. Simonians, and was sentenced to a year's imprisonment for being associated with Père Enfantin in editing *Le Livre Nouveau*. Subsequently he retracted what he had written. He was in 1833 sent by Thiers to the United States to inquire into their railway and water systems of communication. His great work, *Des Intérêts Matériels en France*, appeared in 1837; in 1838 he was made a councillor of State, and in 1840 professor of political economy in the Collège de France. He was an able opponent of Louis Blanc's socialism, which he attacked in *Lettres sur l'Organisation du Travail et la Question des Travailleurs*. He was an advocate of free trade, and aided Cobden in carrying through the commercial treaty between England and France. He died in 1879 at Montpellier.

Chevaux de Frise (lit. Friesland horses) denotes a contrivance for defending a barricade or a breach, or for impeding the advance of troops, especially of cavalry. It consists of a central horizontal axis studded with spears or spikes. In the English service this axis is an iron tube, with holes for the insertion of the spikes, which are, for the convenience of transport, conveyed within the tube. A similar instrument for impeding cavalry by wounding the feet and legs of the horses was known in classic times, and was also employed in mediæval warfare. Tops of walls are sometimes fitted with a similar contrivance.

Cheviot Hills, a range of mountains between England and Scotland, and in the counties of Northumberland and Roxburgh, run from S.W. to N.E. for a distance of 35 miles. Their principal summits are the Cheviot (2,676 ft.) and Carter Fell (2,020 ft.), and in them rise the rivers Liddel, Tyne, and Coquet. They are of trap formation, porphyry, and greenstone, and intersect the old red sandstone and mountain limestone strata. They yield excellent pasture, the Cheviot breed of sheep being celebrated. In former times they were the scene of many fierce struggles between the English and Scots, and are commemorated in the famous ballad of *Chery Chase*.

Chevreul, MICHEL EUGÈNE, chemist, was born in 1786 at Angers. Educated at Paris, he became professor of special chemistry at the Gobelins, and in 1823 published a treatise on animal oils, for which he received a prize of 12,000 francs from the Society for the encouragement of National Industry. In 1830 he succeeded Vauquelin, his former master, as professor of chemistry in the Collège de France, and in 1864 became director of the Museum. In 1886 the centenary of his birth was celebrated, and three years later he died. His works are on dyeing, on colours, history of chemical investigation, theories of matter, etc.

Chevron, an arrangement of two lines or bars inclined to each other at a similar angle to that of the rafters in a roof, whence the name, from the Latin *caprcolus*. In *Architecture* the word denotes a zigzag moulding of the Norman and Transition periods. In *Heraldry* it denotes a device of this form upon a shield, a similar device with narrower bars being called a *chevronel*, or the expression *per chevron* being used when the space between the bars is filled up. The word is familiar as denoting the marks of rank upon the arm of a non-commissioned officer of the army or navy, varying in the former from the four chevrons or stripes of the sergeant-major or staff-sergeant, to the single stripe of the lance-corporal.

Chevrotain, or MOUSE DEER, any species of the family Tragulidæ, with two genera, Tragulus (Asiatic) and Hyomoschus (African), the latter aquatic in habit. The family, which existed in Europe in Miocene times, connects the deer with the swine, and has some affinities to the camels. The species are diminutive and graceful, the body is about the size of that of a rabbit, and the legs are long and slender. There are canine teeth in both jaws; both sexes are hornless, and each limb has four digits.

Chevy Chase, a name sometimes applied to the celebrated border battle—Otterburn (q.v.)—between Percy and Douglas, the memory of which has been preserved to modern times by the stirring ballad of "Chevy Chase," one edition of which may be found in the Percy *Reliques*, though a more modernised form is the most widely known. The word "chevy" or "chivvy," well-known to every boy, is said to be of gipsy origin, and to signify to goad or chase.

Cheyennes, a predatory North American tribe belonging to the Algonquin family, whose original camping grounds lay between Lake Superior and the Upper Missouri, on the Upper Red River of the North, which flows to Lake Winnipeg. Driven

thence by the Dacotahs during the eighteenth centnry, they withdrew west of the Missouri to the Black Hills about the sources of the river from them named the Cheyenne. This word is a corruption of the French *chiens* ("dogs"), a term usually applied to them by the Canadian squatters. Later, they extended their excursions as far as New Mexico, and still infested the banks of the Platte and Upper Arkansas rivers so late as 1850. At that time they numbered 3,000, bnt have since been much reduced by their wars with the hostile Blackfeet and Pawnee nations.

Cheyne, GEORGE, doctor, was born in 1671 at Methlick, Aberdeenshire. He began to practise in London in 1702, being chosen a Fellow of the Royal Society in the same year. He was noted for his corpulence, being 32 stone in weight; he advocated a milk and vegetable diet, which he practised with such good results that he never ceased to recommend it in all similar cases. He wrote numerous medical treatises, and died in 1743.

Cheyne, THOMAS KELLY, Biblical scholar, was born in 1841 in London. Educated at Oxford, he became a fellow of Balliol in 1869, rector of Tendring, Essex, in 1881, and Oriel Professor of the Interpretation of Holy Scriptures at Oxford, and Canon of Rochester in 1885. He was appointed a member of the committee for the revision of the Old Testament. Besides scholarly contributions to periodical literature, he has also published *The Prophecies of Isaiah* (1880), *Exposition of Jeremiah and Lamentations* (1883), and *The Book of Psalms* (1888).

Chhatisgarh, a district of India in the central provinces, covers an area, with its seven small feudatory states, of nearly 40,000 square miles. It is a fertile region and yields large quantities of grain.

Chiabrera, GABRIELLO, poet, was born in 1552, at Savona. He imitated Pindar, and with such success that he is called the "Pindar of Italy." He also wrote epics, bucolics, and dramas. At the age of 50 he married Lelia Pavese, and died in 1637, aged 85.

Chiana, a small river of Italy, and the ancient *Chanis*, waters Tuscany and Umbria. It is now artificially divided into two branches, one flowing into the Arno, and the other into the Paglia. The two are connected by the Chiana Canal, completed in 1823, whereby a large tract has been rendered fertile.

Chiapas, a state of Mexico, on the Pacific, with Guatemala on the S.E., covers an area of over 16,000 square miles. Comprising a portion of the tableland of Central America its climate is to that extent wholesome, but in the lower regions is hot and sickly. Maize, sugar, cacao, and cotton are produced, but immense forests still cover the most part. Its capital is San Cristoval, and its chief rivers, Usumasinta, Tabasco, and Rio Chiapas.

Chiaroscuro, a word used in painting and engraving to express the combined effect of lights and shadows, *i.e.* the diffusion of light in shade and the softening effect of shade upon light, such an arrangement as best imitates the effect of the lights and shades in nature. The most successful handlers of chiaroscuro among painters are Titian, Correggio, Rubens, and Rembrandt. *The Experiment* by Wright in the National Gallery is an interesting example of it.

Chibchas, one of the civilised peoples of the New World, who at the time of the discovery occupied a territory about 6,000 square miles in extent in the province of Cundinamarca, Colombia. They were divided into two hostile nations, with a collective population of over a million, one ruled by the *Cipa* ("lord") of Bacata or Bogota (now Funza), the other subject to the *Zaque* ("chief") of Ramiriqui and Hunsa (now Tunja). The Chibchas, also called Muyscas, had attained a considerable degree of culture, as shown by their paved highways, suspension bridges, temples, colonnades, statues, hieroglyphics, weaving and dyeing, weights and measures, and especially their great skill in gold and silver work. Their descendants have been completely merged in the Spanish population, and, unlike their Peruvian neighbours, have ceased to speak the national language, of which nothing survives except a few songs and an unpublished dictionary.

Chibhâli, an Aryan people occupying the hills between rivers Chinâb and Jhelnm, North-West India; said to be Rajput immigrants, who have adopted the Mohammedan religion, whereas their Dogra neighbours and kinsmen have remained Hindus. Chief divisions and castes: Sudan, Thakar, Pâl-jarâl, Gakkar; speech, a Neo-Sanscritic idiom, closely related to the Pothwâri of West Punjâb.

Chica, or CHICO, (1) a dyestnff, prodncing an orange-red hne, made by boiling the leaves of the *Bignonia chica*, a climbing plant fonnd npon the banks of the Orinoco and its tributaries the Meta and Cassiquiare. The Indians use it for painting their bodies. (2) A kind of maize beer, brewed and drunk in Chile.

Chicacole, a town of India in the Presidency of Madras and Ganjam district, is situated on the Languluja river. Formerly a military station, it is now noted for its muslin manufactures. It is mainly built of mud.

Chicago, a city of the United States, in Illinois, and the capital of Cook county, is situated on the S.W. bank of Lake Michigan and on both sides of the Chicago river. The area of the city was originally a swamp, but it has been drained, and filled in, and many even of the largest buildings raised by ingenious engineering appliances about six feet. It exceeds 23,000 acres, and is divided by the river into three parts, viz. the north, south, and west. These are connected by numerous bridges and tunnels. Its spacious streets are laid out at right angles and are adorned with rows of fine trees. Among its public buildings of note are the county court house and city hall, erected at a cost of 6,000,000 dols., the United

States custom house and post-office, the chamber of commerce, the art institute, and the exhibition building, and the auditorium, with seating accommodation for 7,500. It is also well provided with places of amusement, and has some of the finest hotels in America. Benevolent institutions also abound, and its public parks cover an area of 2,000 acres. The churches number 245, and its Sunday Schools 300. In its public library are about 140,000 volumes. Its public school system is most liberally supported out of a fund exceeding 2,000,000 dols. There are four high schools, 36 grammar schools, and 56 primary schools. In addition it has a number of free schools supported by religious denominations, and more than 300 private schools and academies. The university, which is controlled by the Baptists, has law, medicine, and scientific faculties. The Roman Catholics have St. Ignatius College, and there are four other theological seminaries, six medical colleges, and three commercial schools. The town derives its water through the medium of tunnels, which extend for two miles under Lake Michigan and thus draw off the pure water from that lake. Its sewage is discharged by means of a canal into the Mississippi, the garbage being consumed by fire in a furnace capable of destroying 150 tons daily. To its situation as a great railroad centre, and at the head of the great chain of American lakes, Chicago owes its commercial importance. The Union Stock Yards, covering about 350 acres to the S.W. of the city, form the most extensive live-stock markets on the globe. Its trade in pork-packing is enormous, reaching in busy seasons to as many as 60,000 hogs in one day. It is also the leading American market for grain and timber, and deals largely in flour, provisions of all kinds, wool, hides, etc. This great city suffered severely in 1871, when on October 7th, a Sunday, a great fire broke out, and destroyed 17,450 buildings, rendering 98,500 persons homeless and destroying 200. The loss was estimated pecuniarily at 190,000,000 dols. Three years later another fire destroyed property to the extent of 4,000,000 dols. In 1886 occurred the bomb-throwing by anarchists, whereby eight policemen were killed and 60 injured. Four men were hanged for this, who are still regarded as martyrs by a large number of Socialists and Anarchists in Europe and America.

Chicasaws, a North American nation, closely allied to the Choctaws, formerly occupying the plateaux along the east side of the Mississippi, between the Ohio and Yazoo affluents. They have now been removed to Indian Territory, where their reserve lies between the Canadian and Red rivers, north and south, towards the Texas frontier. Here they numbered 6,000 in 1872, and had a territory of about 4,000,000 acres, mostly cultivated. Like the Cherokees, they have a written constitution, and they still maintain the ancient alliance with the Choctaws, representatives of both nations meeting in a common general assembly. They support a large number of schools, and also send many students of both sexes to the colleges and universities of the United States.

Chichester, anciently *Regnum*, a city of England and capital of the county of Sussex, is situated between the Southdown Hills and the sea. Its leading features are the market cross, which stands at the intersection of the two main thoroughfares, and the cathedral. This dates from the twelfth century, and though not large, is an elegant and well-built structure. Its graceful spire, which reaches a height of 300 feet, fell in 1861, and was rebuilt in 1866. The city is enclosed by its ancient walls, which now form terraces and shady walks. It has twelve parish churches and various public buildings for the convenience of its trade, and other business. Among its educational establishments are a theological college, grammar school, blue-coat and other schools. Its trade is mainly in agricultural produce, and among its industries are wool-stapling, malting, brewing, and tanning. It is connected by means of a canal with the English Channel, which is distant between 2 and 3 miles to the S.W. Most interesting Roman remains have been found here.

Chichimec, a term of constant occurrence in the legendary history of the Aztecs, said to mean "barbarians," and applied generally to the uncivilised peoples who at various periods overran the Mexican plateau, and about the eleventh century destroyed the Toltec empire. Later, they were themselves expelled by the Aztecs and allied Nahua nations, who, two or three centuries before the arrival of the Spaniards, founded the city of Mexico, and in a sense restored the ancient civilisation of the Toltecs. Sahagun distinguishes two great classes, the Tamimé, or "Archers," and the Techichimecs (Teochichimecs), the more savage of the two. Tribes known as Chichimecs are still found in several Mexican states, notably Guanajuato, Queretaro, Jalisco, Aguascalientes, and Zacatecas.

Chickadee, an American name for *Parus atricapillus*, the Blackcap Titmouse, from its cry. The plumage is lead-grey above, whitish below, with the crown of the head black. The name is sometimes applied to allied species.

Chickamauga, a small tributary of the Tennessee river, rises in Walker county, Georgia. On its banks a battle was fought, September 19 and 20, 1863, between General Rosecrans and General Bragg, of the Confederate army, the latter being victorious.

Chickaree (*Sciurus hudsonius*), an American name for the Red, or Hudson Bay, Squirrel. [SQUIRREL.]

Chicken Pox, or VARICELLA, is a specific contagious disease, almost exclusively affecting young children, the characteristic feature of which is a peculiar vesicular eruption. Varicella occurs in epidemics, and until recent years was often confounded with small-pox (*variola*). The two diseases are, however, quite distinct from one another. Chicken-pox is usually a trivial affection, and is never fatal, save in very unhealthy subjects, or when it occurs in the very rare form known as *varicella gangrenosa*. The period of incubation is somewhat uncertain; it is said to average about

fourteen days. The onset of the disease is often marked by slight fever, and then after an interval of some twenty-four hours the rash appears. Reddish papules are first developed, and these rapidly become vesicular; so that a number of rounded minute blebs, containing clear fluid, are seen to be scattered over the body. The back and shoulders are favourite situations for the varicella rash. The rapid development of the vesicles, and the fact that they often appear in successive crops, and rarely become pustular, seldom fail to readily distinguish the disease from the formidable variola. Children affected by varicella should be carefully isolated until all the scabs have disappeared. There is no specific treatment for chicken-pox. The disease runs its course in almost all cases without mishap; all that can be done is to adopt ordinary hygienic precautions, to administer tonic remedies, and to prevent any spread of the malady by isolation and disinfection.

Chick-pea (*Cicer arietinum*), an annual leguminous plant, apparently a native of Armenia, but possibly also of Southern Europe. Its leaves consist of from seven to fifteen egg-shaped, toothed leaflets; its flowers are white or pink and solitary, and its pods from an inch to an inch and a half long, rhomboidal, inflated, and containing two seeds. These being supposed to resemble a ram's head give the plant its specific name. The stem and leaves exude a dew of oxalic acid which crystallises on their surface and will destroy the boots of a person walking through a field. The plant has long been largely cultivated in India under the name of Gram, the seeds being ground into meal, toasted or candied. In France they are used in soups.

Chickweed (*Stellaria media*), one of the commonest English weeds, a small annual belonging to the *Caryophyllaceæ*, with five sepals, five or fewer two-cleft white petals of small size, ten stamens, three styles and a six-valved capsule, but readily recognised by a single line of small hairs along the stem, changing from one side to the other at each pair of leaves. It is collected as a food for cage-birds. It is one of the most widely diffused of flowering plants.

Chiclana, a town of Spain in Andalusia, 12 miles S.E. of Cadiz, noted for its mineral baths. It is built of snow-white stone and produces linen and earthenware.

Chiclayo, a town of Peru and capital of the department of Lambayeque; it manufactures soap and leather, and has rice mills and distilleries.

Chicopee, a town in Hampden county, Massachusetts, U.S., situated on the E. bank of the Connecticut river. Among its manufactures are cotton, bronze cannon, statuary, cutlery, locks, etc.

Chicory (*Cichorium Intybus*), a perennial plant belonging to the *Compositæ*, closely related to the endive (q.v.) and less closely to the lettuce (q.v.) and dandelion (q.v.). It has a long tap-root and rigid branched stem with a milky juice and few cauline leaves, a rosette of pinnately-lobed radical leaves, and large sessile heads of brilliant light blue strap-shaped florets. The heads are surrounded by two rows of bracts, the outer reflexed, and the fruits are surmounted by a rudimentary calyx. The leaves are blanched as a salad and the roots are largely mixed with coffee. Chicory is itself adulterated with carrot, mangold-wurzel, oak-bark, tan, mahogany dust, baked horse-liver, venetian red, etc. It is unwholesome if used constantly in any large proportion to coffee, and has none of the stimulating effect of the latter substance. The plant is wild throughout Europe and Western Asia, growing chiefly on dry soil, and is cultivated in some parts of England.

Chief, Examination of Witness in. [Evidence, Witness.]

Chief Rents, the rents payable by the freeholders of manors, also termed *quit rents* (*quietæ reditus*), because the tenant thereby goes quit and free of all other services.

Chiem-See, a lake of Upper Bavaria, 48 miles from Munich, receives the waters of the Achen and Prien rivers, and discharges by the Alz into the Inn. It lies at an altitude of 1,650 feet above sea-level, and contains famous fish.

Chieti, a city of Italy and capital of the province of Chieti, stands on a hill near the right bank of the Pescava river, about 8 miles from the Adriatic shore. The see of an archbishop, it has a fine Gothic cathedral, and manufactures cloth and silk. It occupies the site of the *Teate* of the Romans, and in 1524 St. Gaetano founded here the order of the Theatines.

Chiff-chaff (*Phylloscopus collybita*, in older classifications *Sylvia rufa* or *hippolaïs*), a small Warbler (q.v.), reaching England as an early summer visitor. The general plumage is olivaceous above, lighter on the under surface. The popular name is derived from the note of the bird.

Chigi, Agostino, of Siena, was the founder of a powerful Italian family, whose head is Prince of Campagnano and Duke of Ariccia. He became banker to the popes, and died in 1512. Fabio, a descendant of the preceding, wore the tiara as Alexander VII., from 1655 to 1667. Flavio, another descendant, born in 1810, became Bishop of Mira, after serving in the papal guard, and ultimately reached the rank of cardinal. He died in 1885.

Chignon, a French word denoting primarily the nape of the neck, and then used to denote the roll of back hair of women, arranged with or without padding at the back of the neck. This arrangement of hair was prevalent about twenty years ago in England, but like other fashions it became exaggerated; the hideous masses of artificial padded hair offended all taste by their monstrosity, and the fashion was abandoned.

Chihuahua, a city of Mexico and capital of the state of the same name, is for the most part well built and has an imposing cathedral. It is in a silver mining district and does a considerable trade. The aqueduct that supplies it with water is three miles long. The state is the largest in Mexico, covering an area of over 83,000 square

miles, great tracts of which are not arable. It is, however, well adapted for stock-raising, and produces cotton in the south. Its leading productions are gold, silver, and copper.

Chikara (*Tetraceros quadricornis*), a small Indian antelope with two pairs of horns, one in front of the other. In the only other species of the genus the anterior pair are rudimentary,

Chilblain, a localised inflammation of the skin of the fingers, toes, ears, and other parts in which the free circulation of blood is interfered with by chilling of the surface. Chilblains rarely affect adults, though those women who never take any form of exercise may be sufferers. In children they are of common occurrence in the winter months, and cause much discomfort by the tingling they produce, while in neglected cases actual breach of surface ("broken chilblains") may occur. If due attention be paid to adequately protecting the legs and feet by woollen stockings, and the hands by warm gloves, and to securing a satisfactory amount of exercise, chilblains should rarely or never occur in this climate. When children are inadequately clothed, are allowed to stand about in wintry weather, and then (when the extremities become blue with cold) are forbidden to approach a fire to warm their hands or feet, the conditions for the establishment of chilblains are effectually secured. Consequently when a child complains of chilblains the most important thing to do is to find out the cause of the mischief, and remedy it. Stimulating applications, such as the tincture of iodine, are certainly of some service (the friction incident to their application being itself of use in promoting the languid circulation); and if an ulcer have formed scrupulous cleanliness with the use of unguentum zinci, unguentum resinæ, or some such form of application is indicated. But to cheerfully adopt measures of this kind, and persevere in the use of the ill-fitting boot, the cotton sock, and other such abominations, is a very mistaken policy. Parents are too apt to content themselves with rubbing in the latest chilblain cure, and allowing the actual and remediable source of the trouble to pass unnoticed.

Child, Francis James, was born in 1825 at Boston, Massachusetts. Educated at Harvard, where he afterwards became a teacher, he in 1848 made his first appearance as an author in his *Four Old Plays*. Ten years later, however, his *English and Scottish Ballads* made a palpable mark as the leading collection of English ballad poetry.

Child, Sir Josiah, was born in 1630 in London. As a navy victualler he accumulated a fortune of £200,000, and in 1678 received a baronetcy. He is now best remembered by his writings, which were on economical subjects. The chief was *Brief Observations Concerning Trade and the Interest of Money*. He wrote against usury, and advocated the compulsory exportation of paupers to the colonies. He died in 1699.

Child, Lydia Maria, writer, was born in 1802 in Medford, Massachusetts. Her maiden name was Francis, and in 1828 she married David Lee Child, a journalist. Together they edited the *Anti-Slavery Standard* in New York. Her works are chiefly novels. She died in 1880.

Child-stealing. [Kidnapping.]

Chili, or Chile. *Geography.* The Chilian territory, containing an area of 300,000 miles, extends from the summit of the Andes on the east to the Pacific Ocean on the west, and from the Camarones river on the north to Cape Horn, the limit of the South American continent, being in this portion separated from Argentina by an imaginary line that runs from Mount Aymon to Cape Virgin and from this cape directly south to the ocean.

The country is a narrow strip of land principally consisting of the rugged western skirts of the lofty Cordillera, which is intersected by a great number of rivers of violent current, with fertile valleys; it is remarkable for a great diversity of climate according to the degree of latitude and the height of the land, and for the variety of its geological and topographical conditions.

Geographers distinguish four zones in Chili:—The *northern* or *mineral* zone, which comprises the province of Atacama (immensely rich in silver), Coquimbo (rich in copper), and the territories of Antofagasta and Tarapacá, famous for the saltpetre, borax, and gypsum, which they produce to an enormous extent. The *second*, or *agricultural* zone, is formed of a great central plain, or succession of valleys, which seem to be the basins of emptied lakes, situated between the Andes and a parallel range; this zone comprises the provinces of Valparaiso, Aconcagua, Santiago, Colchagua, Talca, Maule, Nuble, Linares, and Concepcion; it produces many cereals and rich wine. Araucania, the *third* zone, that extends from the Bio-Bio to the Tolten rivers, is the most beautiful part of Chili, and the home of 30,000 indomitable Indians, famous in history and Spanish poetry on account of their great valour; but now from the north and the south Araucania is being peopled by the white man, and the Indians are doomed to submission, or to emigration across the mountain gorges to the deserts of Argentina. The *fourth* zone is a wild and very picturesque region of lakes.

The name Chili signifies cold in the native Peruvian language; the ancient *Incas*, in giving the name, referred to the eternal snows of the mountain peaks; but the climate is generally temperate and so healthy that no epidemics have ever been known in the country except small-pox. It is worthy of note that in Chili there is an absolute lack of ferocious animals and of poisonous insects of any class.

Several violent earthquakes have shaken Chili, from the Spanish conquest to the end of the last century, but recently they have not been severe, excepting that of 1822, which destroyed Valparaiso, and that of 1835, Concepcion. There are about 70 volcanoes in the Chilian Cordillera; the highest are the Aconcagua (22.418 feet) and the Tupungato (21,660 feet). Off the coast there are many *islands* and archipelagoes. The largest island is Chiloe. Juan Fernandez island was the scene of the solitary

life of Alexander Selkirk, the prototype of Robinson Crusoe.

The *population* of Chili is 2,500,000. The capital, Santiago, has about 200,000 and Valparaiso 130,000. Two-thirds of the population live in the rural districts. The Chilian is of pure Spanish descent or of Spanish blood mixed with Araucanian, a race that in vigour of body and of character can compete in work and war, on land and sea, with the best in the world.

The political *constitution* is very much like that of the United States, but the spirit of unity is much stronger. The civil laws are codified. The educational system resembles that of France; 50,000 children, boys and girls, attend the public schools, and 20,000 private ones.

The army is small, about 3,000 men, the national guard numbers about 100,000. The forts are well fortified. The navy is the finest in South America. The merchant marine, principally coasting and whaling, is growing steadily. Commerce is very prosperous. The largest import trade is with England. The *industries* are chiefly agricultural and mining. They are very extensive and are increasing.

History. Don Diego de Almagro was the first conquistador. He conquered Chili in 1536; he was one of Pizarro's lieutenants, and quarrelled with his chief on account of the distribution of treasure plundered in the conquest of Peru. Almagro had been preceded by a Spanish deserter in Chili, called Barrientos, who taught the Indians how to fight the Spaniards. After much suffering and hard fighting Almagro returned to Cuzco, where he was beheaded. Pizarro then sent a daring young officer called Pedro de Valdivia with 140 soldiers to explore and conquer the country, which he did as far as Valdivia (1541), where he founded that city, as well as those of Serena, Valparaiso, Concepcion, and seven more in Araucania, but all of them were soon destroyed by the brave Araucanians, who also killed Valdivia himself in 1553. The colony was ruined, and other conquistadores were sent in the next century by Spain, who succeeded in conquering the country, only at the expense of millions of money and hundreds of thousands of soldiers. In the seventeenth century the colony suffered intensely on account of pirates, earthquakes, and droughts, and was abandoned again until the eighteenth century, when liberal concessions were made by the Crown of Spain to strong, honest, hard-working people of Biscay, who quickly raised the land to prosperity. Many distinguished men were produced in that period, who rose against the government of the mother country, declaring the independence of Chili. A Spanish army from Peru reconquered the colony, but General San Martin, the Argentine patriot, crossed the Andes, and in the splendid victories of Chacabuco and Maipo destroyed the Spaniards. Lord Cochrane was the admiral of the Chilian ships, assisted by the young and brave Blanco Encalada. O'Higgins was the first dictator of the country, but in 1823 he was overthrown. From that time political matters were very unsettled until 1830, when, after the battle of Lircai, Prieto was named constitutional president. The country was governed in peace until the war with Peru and Bolivia, in which Chili was victorious (1839). Thenceforward, under the Constitution, Chili distinguished itself above all the South American states in the enjoyment of an excellent, though rather oligarchical, government. In 1865 Chili assisted Peru in her war against Spain, and Valparaiso was bombarded by the Spanish fleet. In 1879 the Republic was engaged in another long war with Peru and Bolivia, which resulted in the conquest of the territories of Antofagasta and Tarapacá, after bloody battles on sea and land, of which Miraflores, the decisive one, is well worthy of mention.

In 1891 a civil war was produced by the conduct of President Balmaceda, who assumed powers which Congress deemed unconstitutional. Balmaceda, however, was defeated and committed suicide, and the Congressional party, after a hard struggle, triumphed, and restored the republic to peace and prosperity.

Chili Pepper. [CAPSICUM.]

Chili Saltpetre consists of nitrate of soda, $NaNO_3$. It hence differs from nitre or saltpetre, KNO_3, only in the substitution of sodium for potassium. It crystallises in rhombohedra closely resembling cubes, and is also called *cubic saltpetre*. It occurs largely as a deposit on the soil in Peru and Bolivia. Being cheaper, it is largely used instead of nitre for the preparation of nitric acid. It cannot be used in place of nitre for the production of gunpowder, however, as it attracts moisture from the air and deliquesces. Small quantities of sodium iodate, $NaIO_3$, are generally present also, and it is hence employed as a source of iodine.

Chillan, a town of Chili and capital of the province of Nuble, is a commercial centre of some importance. It is composed of adobe houses, built low by reason of the prevalence of earthquakes. It is connected by rail with Santiago and Talcahuano.

Chillicothe, a city of the United States of America, and capital of Ross county, Ohio, is situated on the right bank of the Scioto river and on the Ohio canal. Among its manufactures are carriages, paper, iron, leather, and agricultural implements. It was the capital of the state from 1800 to 1810.

Chillingworth, WILLIAM, divine, was born in 1602 at Oxford. Elected a scholar in 1618 and then in 1628 a Fellow of Trinity College, he devoted himself to the question of paramount interest at that time, viz. the differences between the Anglican and Romish churches. The result was that he adopted the doctrines of the latter, and in 1630 went to Douay. Here further investigation led him to renounce the claims of Rome to infallibility, and he was unable to take orders in the Church of England through the Thirty-nine Articles. He now got entangled in a mass of controversy with different Catholics, and out of this came his most celebrated book, *The Religion of Protestants a Safe*

Way to Salvation, being a reply to a Jesuit, Edward Knott. After this, his scruples against the Articles of the Church appear to have been removed, and in 1638 he was made chancellor of the diocese of Salisbury. At the breaking out of the Civil war he accompanied the Royalist forces and was with them before Gloucester. At the surrender of Arundel Castle he was taken prisoner, and, falling ill, was lodged in the bishop's palace at Chichester. Here he died in 1644 and was buried in the cathedral. Besides his chief work already mentioned, he published many sermons, and contributed largely to the theological polemics of his time.

Chillon, a castle of Switzerland, situated at the eastern extremity of the Lake of Geneva on an isolated rock. Surrounded by deep water, it is reached from the mainland by a bridge. It is now used as an arsenal. It is interesting as being the scene of Byron's poem, *The Prisoner of Chillon;* the prisoner was Bonivard, who from 1530 to 1536 was immured here.

Chiloe, an island on the west coast of S. America, forms with other smaller islands and a part of the mainland a province of Chili. Covering an area of nearly 4,000 square miles, it is inhabited mostly by Indians, and is in the main hilly. The climate is humid, and except along the shore the surface is covered with impenetrable forests. The capital is Ancud, on the north coast, and is the seat of a bishop. The chief export is timber.

Chilognatha. [Millepedes.]

Chilopoda. [Centipedes.]

Chiltern Hills, a range of chalky hills running through the counties of Oxford, Herts, and Bucks, are from 15 to 20 miles broad, and reach their greatest altitude near Wendover at 905 feet above sea-level.

Chiltern Hundreds. The stewardship of the Chiltern Hundreds has long ceased to have any duties attached to it, but the nominal office is retained to serve a particular purpose. A member of the House of Commons, who is not in any respect disqualified, cannot resign his seat. A member, therefore, who wishes to resign, accomplishes his object by applying for the stewardship of the Chiltern Hundreds of Stoke, Desborough, and Bodenham, which, being held to be a place of honour and profit under the Crown, vacates his seat, and a new writ is in consequence ordered. This nominal place is in the gift of the Chancellor of the Exchequer. As soon as the office is obtained, it is resigned, so that it may serve the same purpose again. The practice began about the year 1750. The "Stewardship of the Manor of Northstead" is a similar office. Formerly the hills above-named were covered with beechwood, and sheltered numerous robbers, and the office was created to put these marauders down and protect the inhabitants from their depredations.

Chimæra. 1. A fabulous monster of ancient classical fable, represented by Homer as having a lion's head, a goat's body, and a dragon's tail. It devastated Lycia, and was slain by Bellerophon. A carving from Asia Minor, now in the British Museum, represents it as a lion with the head and neck of a goat growing out of the back. It is found as a device in heraldry, and the name is used metaphorically to signify an extravagant and groundless fancy. Milton speaks of "chimæras dire," and the word is used by Macaulay and by Tennyson.

2. A genus of cartilaginous fishes (q.v.), constituting, with Callorhynchus (from the South Pacific), the family Chimæridæ and the sub-order Holocephala. The type-genus is closely akin to the sharks and rays, between which and the ganoids it forms a connecting link. The species possess four branchial clefts covered by a fold of skin; the skin is naked, and there are no spiracles or spiral valve. There are three species:—*C. collici*, from the west coast of North America; *C. affinis*, from the coast of Portugal; and *C. monstrosa*, the best known species, often called the king of the herrings, from its pursuit of these migratory fish. It is found on the coasts of Europe and Japan, and at the Cape of Good Hope. It is a very ugly fish, some three feet long, of a brownish colour, marbled with a lighter shade.

Chimborazo, a mountain peak of Ecuador, belonging to the Andes, rises to the height of 20,703 feet above sea-level. It was first ascended in 1880 by Mr. E. Whymper. Chimborazo is also the name of a province on the south of the mountain, and covering an area of 5,523 square miles.

Chimney (Gk. *kaminos;* Lat. *caminus*, a hearth) is a generic word, denoting the tube or other contrivance by which the smoke of a fire within a building or other enclosed space has access to the outer air. The method of chimney building in ancient times is not much known. In more modern times there has been constant progress, from the simple hole in the roof by which the smoke might escape if it could from the Saxon hall, through the wide chimney of mediæval houses, which was roomy enough to allow the construction of unsuspected hiding-places, and which has lingered on in the wide chimney of old farmhouses down to the modern flue, which, built with a knowledge of the principle that narrowing the aperture increases the draught, may be reduced by means of a register to a diameter of only a few inches. With a view, also, of giving a steady and strong upward draught, modern chimneys are carried to such a varying height above the house-roof as frees the chimney from eddies of wind caused by the irregularities of the roof, and to the top have been added various contrivances for ventilation, a still further protection from eddies of wind. This increased height has made chimney building of some importance from an architectural point of view as giving scope for ornamentation, and some of the chimney stacks of Elizabethan houses and their modern imitations are quite works of art. Of the chimney of feudal times, with its wide throat and its horizontal opening to the outer air, called the *louvre*, some ancient castles, notably that of

Rochester, give us examples. To show how chimneys have been subservient to the architect's and sculptor's arts by giving occasion for the construction of elaborate ornamental chimney-pieces would require a separate article. In 1842 an Act was passed to put a stop to the practice of boys climbing chimneys to clean them, but it was some time before the Act was enforced generally, at least in country places. Chimneys sometimes, through neglect or accident, take fire, but the fire may easily be put out by stopping up with a wet blanket or other such like thing the opening of the fireplace so as to prevent air from below from obtaining access to the fire.

Chimney, Factory. The intensity of the draught through a fire may be increased in two ways. A blast of air may be forced through it by bellows, fan, or other pumping machinery; or a greater current of air may be induced to pass through by the use of a high chimney. This second method is much employed in factories, for, besides producing greater draught, the products of combustion, which in many cases are objectionable and injurious to animal and vegetable life, are discharged at a sufficient height to render them less harmful. Inside the chimney there is a column of hot gases; outside the air is colder, and a column of this cold air of the same length and sectional area as the chimney would be heavier, and would exert a greater pressure at the base of the chimney. Hence the difference in the pressures of these two columns will force the inside gases upwards, this force depending on the temperatures of the burnt gases and of the surrounding air, and on the height of the chimney. Other things being equal, the draught is increased by lengthening the chimney; also the draught is greater on a cold day than on a hot day, greater at night than in the daytime. The Townsend shaft in Glasgow has a height of 468 feet; St. Rollox shaft, Glasgow, 456 feet; and Mechernich shaft, Cologne, 441 feet. These are among the highest chimney-shafts.

Chimpanzee, any anthropoid ape of the genus Anthropopithecus, from tropical Africa. (The name Troglodytes, though still found in text-books, should be dropped, as it properly designates a genus of birds, of which the Wren (q.v.) is the type.) The species are of large size, with very long arms, long narrow hands, and feet that can be planted flat on the ground so that an erect or nearly erect posture can be readily maintained, though their favourite mode of progression on the ground is a kind of canter on all-fours, the back of the knuckles being called into play. There are no callosities on the haunches, nor is there a tail. These animals dwell in the deep forests, and are partially arboreal in habit. They are said to form small societies and to build a kind of shelter for the female and her young in the branches of trees, the male passing the night on the ground. Their diet is chiefly fruit, but, at least in the case of the Bald-headed Chimpanzee, probably varied in the wild state, as it certainly is in captivity, by small mammals and birds. The number of species is not determined; but, omitting the gorilla (q.v.) as being possibly entitled to generic rank, two seem to be well defined; the Common Chimpanzee (*A. troglodytes, Troglodytes niger*) and the Bald-headed Chimpanzee (*A. calvus*, provisionally assumed to be the *T. calvus* of Du Chaillu). The first-named is by far the better known, many species having been exhibited in England from time to time. The body, forehead, and cheeks are covered with long, harsh black hair; the face is a dirty flesh-colour; the chin and upper lip are covered with long white hair; the hands and feet are brownish, and the hair on the rump is white and long. "Sally," the Bald-headed Chimpanzee, which was acquired by the Zoological Society in 1883 and lived in the Gardens for about eight years, is the best known example of the second form, only one other example having been brought alive to this country or indeed to Europe. The chief external marks which differentiate the Bald-headed from the Common Chimpanzee are the scanty covering of hair on the body, the large naked ears standing out nearly at right angles to the head, which is thinly covered with short black hair, and the much darker colour of the skin of the face, ears, and limbs. (*Proceedings of the Zoological Society*, 1885, p. 673; 1889, p. 316; *Nature*, Jan. 10, 1889.)

China, a vast empire in Eastern Asia, consisting of China Proper, Manchuria, Mongolia, and Eastern Turkistan, with the dependency of Tibet.

Geography. China Proper is situated between lat. 42° and 20° N., and long. 122° and 98° E., and covers an area of about 1,348,870 square miles. It is thus about eighteen times as large as Great Britain. It measures 1,474 miles from north to south, and 1,355 miles from east to west. For administrative purposes it is divided into eighteen provinces, eight of which are on the north of the Yangtsze Kiang, and eight on the south; the remaining two, Ganhwuy and Kiangsu, being crossed by its stream. This great river, which rises in the same highlands which give birth to the Brahmapootra, Mekong, and Salwen, thus divides China into two nearly equal parts; and it further forms the boundary between the mountainous and hilly southern portion of the empire and the great plains and uplands of the north. Southward from its bank the country presents a succession of hills and mountain ranges which are broken only by the narrow valleys along which run the roads, or native bridle paths which serve the purposes of land communication throughout the southern provinces. So narrow are these paths that, with the exception of a portion of Yunnan, nothing on wheels can traverse them; the only means of land conveyance being horseback and sedan chairs. On the north, on the contrary, we find a huge delta plain stretching from the Yangtsze to the neighbourhood of Peking, a distance of 700 miles from north to south, and from 150 to 400 miles from east to west. To the westward of this plain, and separated from it by the Peiling Mountains, lie the uplands of Szech'uen, while to the north of that range there stretches away, as far as the Great Wall, a comparatively open country extending over the provinces of Kansuh, Shensi, and Shansi.

The most noteworthy feature of China north of the Yangtsze is the vast deposit of loess which covers an area of 250,000 square miles, comprising parts of the provinces of Chihli, Shansi, Shensi, Kansuh, and Honan. This strange deposit, about the origin of which geologists are much divided, covers the ground to the depth, in some places, of 1,000 feet, and gives a uniform yellow tinge to the whole landscape. In substance it is a light, friable soil, and when watered by seasonable rain it is eminently fertile. Its porous structure, however, renders it extremely liable to drought when the rain fails. At such seasons the area it

MAP OF CHINA.

result is that a constant process of silting-up has been going on for many centuries. To counteract this evil the Chinese, instead of dredging the bed, have done exactly as the Italians have done in similar circumstances with the river Po. They have embanked its borders, and as the silting-up has continued, have laid layer upon layer on the embankments until at the present time the bed of the river is for a considerable part of its course above the level of the surrounding country. The danger of this condition of things is obvious, and is frequently emphasised by the recurrence of disastrous floods which lay waste the whole of

covers, which, from its general productiveness, has earned for itself the title of the Garden of China, becomes a dusty, barren tract. The seed, exposed to the sun by the action of the wind on the light surface soil, perishes in the ground, and the farmers are helpless spectators of the ruin of their crops. One remarkable characteristic of the loess is that it cleaves vertically, and as its porous nature prevents it affording a resting-place to streams and rivers, all waters intersecting it have to cut their way through to the firm bed beneath. The result is that the surface of the country is waterless, while the streams and rivers, which in many cases are as much as 1,000 feet below the level of the land, are bordered by perpendicular cliffs.

The one exception to this rule of the streams is the Yellow river, which takes its name from the yellow colour which the loess, brought down in its current, gives to its waters. Being a sluggish stream this river is not swift enough to rid itself of the deposit of loess which it gathers in its course, and the the neighbouring country. An attendant evil resulting from this state of things is that this huge river is for navigable purposes practically valueless. Only light native craft can navigate its waters. The Great Canal also, the work of Kublai Khan, which connects Hangchon Fu in the province of Chĕkiang with Tientsin in the neighbourhood of Peking, is through portions of its course, partly from the same cause and partly from neglect, in the same useless condition. Neither of these waterways can compare for an instant in importance with the Yangtsze Kiang, which runs a course across China of 2,900 miles, and is navigable by steamers as far up as Ichang, a distance of 963 miles from the mouth. Above this point the stream is disturbed by a succession of rapids formed by the débris of the cliffs which line its course through the mountainous region which separates western China from the Eastern provinces. At certain seasons of the year it is possible that steamers might be able to ascend this broken water, and by

the Chefoo convention the right of running steamers as far up as Chungking in Szech'uen was conceded by the Chinese. By a later agreement, however, Sir John Walsham, the British minister at Peking, resigned this privilege. The southern portion of the empire is abundantly watered, the largest river being the Sikiang, or West river, which, rising in Yunnan, runs through the provinces of Kwangsi and Kwangtung, and empties itself into the China Sea in the neighbourhood of Macao. This river is navigable for vessels not drawing more than 15 feet as far up as Shaoking, a distance from its mouth of 130 miles.

Climate. In such a huge empire as China it is impossible to generalise as to the climate. This will be sufficiently plain when we state that while during the winter months the northern provinces are fast icebound, the ice even extending some distance into the Gulf of Pechili, the thermometer at Canton has never been known by Europeans to fall below 29°, the average temperature in January and February, the coldest months, being from 50° to 60°. It is noticeable, however, that the temperature of the whole empire is lower than that of any country in the same latitude, and judging from the physique of the people and the teeming population, it may be assumed that the climatic conditions are generally favourable. This, also, is in face of the very insanitary conditions in which the people live, and which give rise at times to most destructive epidemics. Of these, cholera is the most common, and at times this terrible scourge more than decimates the populations on the scenes of its ravages. Smallpox is endemic in China, and is as universal among children as measles is among ourselves. In a large proportion of cases the disease proves fatal, but since almost every child suffers from it, it is practically unknown among adults. Fevers, of course, are common; and in the south-western province of Yunnan a strange disease, resembling in some respects the Plague, occasionally desolates whole districts. From the accounts furnished by the Roman Catholic missionaries it seems that the first warning of the approach of the epidemic is a mortality among the rats, which forsake their holes and fall dead on the surface of the ground. Larger animals are next seized, and finally the disease attacks human beings. The symptoms are high fever and the appearance of swellings in the armpits and at the back of the neck. As a rule, death occurs in a few hours after seizure.

The *Flora* of China is as wide in its range as the climate is various. At Hongkong, an island which is peculiarly rich in botanical specimens, the flora presents the features of that of tropical Asia, while in the central and northern provinces we recognise the characteristics of the flora of the Himalayan region. Among the most notable trees of China are the bamboo, which grows in all but the most northern provinces of the empire; numerous coniferæ, palms, the willow (the graceful growth of which causes it to be used as a favourite simile by poets for all that is elegant and pliant in form), the oak, chestnut, walnut, and the eleococca cordata, which flourishes in Western China, and which is particularly admired for the beauty of its growth and the hardness of its timber. It is from this wood that the pillars are made which are used to support the roofs of the palace buildings, as well as of all the principal yamens and temples throughout the empire. Of the flowers, the camellia japonica is most highly prized by the Chinese. The ranunculaceæ stand next in rank, and include eight species of flowering magnolias, the tree peony, or "King of Flowers," as the Chinese call it, various species of clematis, and the lotus. Among the flowers must also be included the poppy, which, while it is admired for its beauty, has a bad reputation as the producer of opium; and the various kinds of azaleas, wild roses, and honeysuckles, which clothe with much beauty the hills in Central China. Of the grains of China, rice is the most important, and is grown in most of the southern and central provinces of the empire, while in the north, wheat, oats, millet, and maize form the staple crops.

Of wild *animals*, tigers, wolves, foxes, monkeys, wild cats, and various kinds of deer, including the musk deer, are the most conspicuous, while the horse, water buffalo, oxen, and dog are domesticated for the service of man.

Among the *products* of China tea still holds the first rank, although as will be seen presently, so far as the English market is concerned, the amount exported is falling off, and the value represented by it has considerably decreased. Roughly speaking, Chinese tea is to be divided into two kinds, black and green. The best black teas are grown in the provinces of Fuhkien, Hupeh, and Hunan, and the best green teas in the provinces of Chĕkiang and Ganhwuy to the south of the Yangtsze Kiang and west of Ningpo. Besides the better kinds, rough sorts of both black and green teas are grown in the provinces of Kwangtung and Szech'uen. Silk is produced wherever the mulberry tree is grown, or, in other words, in every province of China. The finest kinds are produced in Chĕkiang, and are known in commerce as tsatli, taysaam, and yuenhwa; next in quality stand those which come from Kwangtung, Szech'uen, and Kiangsu, while coarser kinds come from Shantung and the other provinces. The sugar cane is largely cultivated in Kwangtung, Fuhkien, and the island of Formosa, and cotton is grown in most of the central provinces—notably Kiangnan, Honan, Hunan, and Hupeh. Camphor is an important article of export from the island of Formosa, where the growth has until lately been a monopoly. Since this has ceased, the farmers on the mainland are beginning to plant the trees, and no doubt camphor will shortly become one of the principal products of Fuhkien. In Kwangsi the cassia tree is commonly grown, and considerable supplies of rhubarb are produced in Shensi and Szech'uen. Of the manufactured products, porcelain is the most valuable, and the principal seat of the industry is at Kingtihchen in Kiangsi, but this is not by any means the only place where porcelain is made. It is manufactured in thirteen out of the eighteen provinces. In Honan there are as many as thirteen places where it is produced; in both Chĕkiang and Kiangsi there are eight; and there are five each in

Chihli, Kiangnan, and Shansi. Naturally the principal places are in the neighbourhoods where the chief materials used in the manufactures are found, viz. pih-tun-sze, which is a mixture of felspar and quartz, and kaolin, which is a hydrated silicate of alumina. Lacquer ware and cloisonné wares or enamels are also among the chief artificial products of the empire.

There is probably no country in the world which is so thoroughly cultivated as China. With the most untiring industry every piece of land which is capable of producing anything is carefully tilled, and is compelled to yield its quota towards supplying the wants of the people. With like industry trade is perseveringly fostered, and the results are visible in the garden-like appearance of the country and the crowded and bustling aspect of the cities. On all sides evidences of agricultural industry and commercial enterprise are observable, and it needs but the application of mechanical science to make China one of the richest and most prosperous empires under the sun. The wealth and magnificence, which so astonished Marco Polo when he visited the chief centres of trade, had grown up during many centuries, and have, since the days of the Venetian traveller, made steady and considerable advances. By the establishment of trade with Europe an immense impulse was given to the commerce of China, and at the present time the foreign trade of the country has exceeded the wildest dreams of the most sanguine pioneers of trade at Amoy and Canton. The Portuguese were the first Europeans who gained a footing in China. But their stay in the country was of short duration. And though both the Spanish and Dutch attempted to make settlements on the coast, it was not until the East India Company succeeded in the seventeenth century in opening a trade with Amoy that Europeans were again permitted to exchange commodities with the Chinese. Later on a factory was established at Canton, which until the treaty of 1842 was practically the only seat of English trade in China. By the treaty executed in that year the four additional ports of Amoy, Fuhchow, Ningpo, and Shanghai were opened to trade. By the treaty of Tientsin which was concluded after the war in 1858, Newchwang, Tientsin, Chefoo, and Swatow, with Chinkiang, Kiukiang, and Hankow in the Yangtsze Kiang, were added to the number of treaty ports. Yet again, Ichang, Wuhu, Pakhoi, Wenchow, and Chungking have, by later conventions, been thrown open to trade, so that at the present time we have seventeen commercial settlements on the mainland, besides Tamsui and Takou on the island of Formosa. The increase in the value of foreign trade effected by the multiplication of the treaty ports is very remarkable, and only shows what an enormous addition to the trade of the world might be brought about were the country thrown open to foreign commerce. In 1864 the total value of foreign trade, including both exports and imports, was 94,864,943 taels (a tael is worth about 5s. 4d.). In 1871 this sum had increased to 136,956,238 taels. In 1881 it amounted to 163,363,851 taels, and in 1890 to 214,237,961 taels. Of the trade represented by these figures the lion's share fell to Great Britain. In the years named the values of the direct trade with Great Britain amounted to 47,978,314 taels, 68,960,954 taels, 46,468,881 taels, and 37,703,273 taels. It will thus be observed that the direct trade with Great Britain has fallen off, but, on the other hand, the trade between China and Hongkong has largely increased. Not to go farther back than 1881, the value of the trade with Hongkong in that year was 48,851,313 taels as against 104,987,865 taels in 1890. This large increase is to be accounted for by the fact that Hongkong has become a depôt, to which goods from the treaty ports are shipped, and from which they are distributed to their final destination. Unfortunately the Hongkong returns do not distinguish the trades with the different nationalities, and it is therefore impossible to say what share of the increase of the trade with Hongkong is to be credited to Great Britain, but there can be no doubt that the falling off in our direct trade is more than compensated for by the increase of our share in the Hongkong traffic. On the other hand, the trade between China and India shows a marked falling off, the value of the direct trade with that country being, in 1881, 27,312,293 taels, and in 1890 only 11,355,978 taels. This cannot be considered a satisfactory state of things. While the total volume of trade with China has enormously increased, our share in it has done little more than hold its own. On the other hand, the values of the trade with the other countries of Europe, including Russia, were 16,492,449 taels in 1881, and 23,028,074 taels in 1890, showing a growth of more than 25 per cent. No doubt the competition of the Indian and Ceylon teas has affected both the amount of tea exported to Great Britain and the price that it fetches. On the whole, however, the amount of tea exported from China has not very materially diminished, a fact which is to be accounted for by the increase in the use of China tea both in America and Russia. The export of silk in 1889 was the largest of any one year since the opening of the treaty ports. But here, again, a diminution appears in the amount imported into Great Britain, and an increase in that taken by other countries. No doubt, with an access of energy, our merchants would be able to keep pace with their continental competitors. But this they are not doing at present.

History. If we were to accept the views of the Chinese as to their own history, we should be obliged to believe that their progenitors were created on the soil of China. But we need not put the strain on our credulity. Recent research has shown abundantly that the Chinese came from the region on the south of the Caspian Sea, about the 22nd century before Christ. Within historic and even recent times we have had instances of the migration of whole tribes from one part of Asia to another, and there would be nothing more unusual in the migration of the Chinese from Susiana to China forty centuries ago than there was in the removal of the 600,000 Kalmucks, who, at the end of the last century, marched from Russia to the confines of China. It appears certain that the immigrants, on approaching China, struck the upper

bend of the Yellow river, and, following its course southward, reached the loess country, of which mention has already been made, and which, after their wanderings through the deserts of Central Asia, appeared to their eyes as a land flowing with milk and honey. But like the Jews of old, they found the country already occupied, and, like the followers of Moses, they were obliged to drive out the inhabitants before them. This they did as much by measures of peace as by weapons of war. Those tribes who accepted their rule were allowed to possess their souls in comfort and to enjoy the privileges to be derived from the higher civilisation which belonged to the intruders. Tribes which were not so amenable were driven out, and wandered gradually southward as the Chinese advanced into the empire. Remnants of these fugitives are still found on the southern and south-western frontiers of China. At the time when Chinese history emerges from fable we find the people settled in the fertile districts of the modern provinces of Shansi and Honan. At this period, and for many centuries afterwards, the empire consisted of a collection of separate states, each of which was ruled over by a king, and over all of which dominated a ruler who was elected from among the kings. During the early state of the settlement in China their system of government appears to have answered well, but by degrees the inevitable jealousies which grew up between the kings led to constant wars and rumours of wars. Such was the state of things in the 6th century B.C., when Confucius attempted to lead the people back to the pristine simplicity of their government and administration. But his admonitions proved fruitless to check the anarchy of the time, and for the next three hundred years the country was given up to constant internecine struggles. At the end of that time (246 B.C.) a sovereign arose who has left his mark on China through all succeeding ages. Chi Hwangti, seeing the necessity of centralising the supreme control, and having the power to do it, abolished the feudal system, which had up to that time existed, and established an empire. To counteract the influence of the writers of antiquity who supported the system he had abolished, he decreed that all books with the exception or those on medicine, agriculture, and divination, should be burned. Fortunately, though he was powerful enough to issue this command, he was not able to have it carried out in its entirety, and, in spite of his ukase, copies of all the works regarded as classics were preserved by the people from this *auto-da-fé*. In opposition to this infamous act of destruction, he executed a constructive work, which is one of the seven wonders of the world, and which will for ever make his name notorious. In order to oppose the inroads into the empire of the Hiungnu Tartars he determined to build the Great Wall along his northern frontier, which still stands as a memento of the first Emperor of China. On the death of Chi Hwangti attempts were made to restore the feudal system, but a successor to the late Emperor arose in Kaoti, who (206 B.C.) founded the dynasty which is known as the earlier Han. With the establishment of peace efforts were made to nullify the effect of Chi Hwangti's destruction of the books. Scribes were employed to multiply copies of the existing texts, and a great revival of learning succeeded the artificial darkness imposed on the people by the former ruler. From that time onwards the course of the empire has followed the lines then laid down, and though dynasty has succeeded dynasty, though revolutions have disturbed the country, and though successful invasions have placed the heels of conquerors on the necks of the people, the nation has remained true to its traditions, and has accepted the political changes which have overtaken it only on condition that the new sovereign should rule in conformity with the teachings and doctrines of those whom they have been taught to regard as sages. The principal recognised dynasties which have ruled the land since Chi Hwangti are as follows:—The earlier Han dynasty (B.C. 206–25 A.D.); the late Han (25–220); the Wai (220–280); the Western Tsin (265–317); the Eastern Tsin (317–420); the Sung (420–479); the Ts'i (479–502); the Liang (502–557); the Ch'in (557–589); the Sui (589–618); the T'ang (618–907); the later Liang (907–923); the late T'ang (923–936); the late Tsin (936–947); the later Han (947–951); the later Chow (951–960); the Sung (960–1127); the Southern Sung (1127–1280); the Yuen (1280–1368); the Ming (1368–1644); the Ts'ing (1644, still ruling). The present Ts'ing or Manchu rulers are descended from the Kin Tartars, who from 1115 to 1280 held sway over the northern province of the empire. During the political confusion which preceded the fall of the Ming dynasty the Manchus were invited to restore order. This they readily undertook to do, but when they had accomplished their mission they refused to retire across the frontier, and being in the position of *beati possidentes* they determined to remain so. In accordance with this decision they put their own sovereign on the throne, who ruled as Shunti, the first Emperor of the Ts'ing dynasty. Three of the first emperors of this line, Shunti, K'anghi, and K'ienlung, were all men of great ability, and succeeded in firmly establishing their rule over the people. During this century several wars and rebellions have threatened the overthrow of the Manchus, but at the present time, in spite of secret societies and the universal corruption which exists in official circles, there appears to be every prospect of their being able to keep the throne.

The Chinese describe themselves as being followers of three *religions* or sects: viz. Confucianism, or the religion of scholars, Buddhism, and Taoism. Of these three, Confucianism unquestionably holds the first place. Properly speaking it is not a religion, but a system of morality. As preached by Confucius it simply dealt with the relations existing between man and man, and made no mention whatever of a deity. Virtue was to be followed for virtue's sake as well as for the temporal advantages which that pursuit is certain to entail. No future rewards were offered to tempt men to act righteously nor was the fear of future punishment held out to keep men in the paths of well-doing. The nature implanted by heaven in the breast of every man was, he taught, perfectly good,

and he held that by keeping this uncontaminated from evil and by following its dictates men might be enabled to reach perfection, and to become "the equal of heaven." A careful observance of the rules of propriety and of general conduct was, he considered, the right way of leading men to this much-to-be-desired consummation. Such were the leading doctrines of Confucius as taught by the sage. As time advanced they became overlaid with the subtleties of the schools, and by the superstitious beliefs which have corrupted the religion of Buddha and the philosophy of Laotsze, the founder of Taoism. It is uncertain when Buddhism was first introduced into China; but it appears probable that the first tidings of it reached that country from India during the reign of Mingti (A.D. 58–76). It was during that reign, we are told, that the first Indian missionary arrived at Loyang, which was then the capital of the empire. This pioneer was speedily followed by others, who brought to the knowledge of the Chinese the Mahâyâna system, which was the outcome of the change which the religion had undergone in India. Under this system Nirvâna had, as a reward for virtue, been supplemented by "the pure land in the west," which was to be the blissful abode of all those who worshipped Buddha and worked righteousness. This more material conception of the faith recommended itself to the practically-minded Chinese, who have again supplemented it by the invention of a Pantheon of deities. Like Buddhism, Taoism in the shape of Buddhism had its origin in India. Like Brahma, the *Tao*, which Laotsze preached, was the mother of all things. All things originated from it, conformed to it, and to it at last returned. The object of this system was to enable men by self-emptiness and giving free scope to the uncontaminated nature implanted in them, to attain to absorption in Tao. Such subtleties were unsuited to the Chinese, who speedily reduced them to a system of magic, and sought in elixirs and charms to secure to themselves a prolonged existence among the pleasures of sense, which they professed to believe represented the *summum bonum* offered to their view by Laotsze. Like Buddhism, also, Taoism in its later development degenerated into a system of idolatry. Thus these two foreign faiths supply the supernatural element which is wanting in pure Confucianism, and form with it a complex system which is practically the religion of the people at large, few of whom can be said to follow distinctively any one of the three creeds.

The *government* of China may be called a patriarchal despotism. The Emperor is the father of the people, who are bound to offer him implicit obedience so long as his rule is just and beneficent. A departure on his part from the paths of justice justifies the people in rebelling against him. In the administration of the empire the Emperor is assisted by a privy council, the Tsung li Yamên, or Foreign Office, and six Boards, namely, the Boards of War, of Punishment, of Works, of Office, of Rites, and of Revenue. To these Boards is entrusted the control of the provinces into which the empire is divided. Fifteen of the eighteen provinces are grouped into eight viceroyalties, while the remaining three are administered by governors. Each viceroy or governor is practically his own law-maker within the limits of the statutes of the empire, and he is practically independent so long as he conforms to these. He raises his own army and navy, levies his own taxes, and, with some exceptions, is the final court of appeal in judicial matters. Each of the fifteen provinces above mentioned is ruled by a governor in subordination to the viceroy, and is subdivided into districts which are administered by Taotais or Intendants of Circuits, Prefects, Sub-Prefects, District Magistrates, and a vast number of petty officials.

The civilised *inhabitants* of China, as distinguished from the surrounding Miao-tse wild tribes, are now supposed to be comparatively recent intruders in the Hoang-ho and Yang-tsze basins, where the primitive Bak tribes arrived from the west or north-west, probably not more than 5,000 years ago. Before the immigration they appear to have been long in contact with the civilised Accado-Semitic populations of Mesopotamia, Hence they reached China already a somewhat cultured people with a knowledge of letters, astronomy, and various arts. The Baks, like the Accads themselves, were doubtless of Mongolic stock, and in their new homes they intermingled with the aborigines, who were chiefly Shans, also of Mongolic stock. Hence the essentially Mongolic and somewhat homogeneous character of the present Chinese populations, whose nationality can always be detected at the first glance; hence, also, the stagnant nature of their civilisation, for the Mongol, as compared with the European, is distinctly unprogressive. In the early period of their history they developed the arts and sciences which they had brought with them to a limited extent; but since then they have mostly remained at a standstill, and even now find the greatest difficulty in assimilating Western ideas. Their astronomy is still almost in the astrological state; their religion is a system of cold moral precepts, combined with ancestry and spirit (demon) worship; their medical art is a hopeless mixture of superstitious practices, nostrums, and a little common sense. Physically the Chinese are below the middle height, averaging about 5 feet 4 or 5 inches, with somewhat coarse thick-set frames, prominent cheek bones, oblique eyes, small nose, broad flat features, yellowish complexion, long lank black hair, sparse or no beard, inanimate expression, with great staying power and capacity for enduring fatigue and hardships on poor fare; they are naturally frugal, thrifty, and parsimonious, though given to reckless gambling, excessively courteous among themselves, but rude and aggressive towards strangers, with a deeply-rooted feeling of contempt and even hatred of foreigners and all their ways. A characteristic trait is their excessive gregariousness, shown in the tendency to crowd together in large villages and cities, so that small hamlets and scattered farmsteads are scarcely anywhere seen in China. In San Francisco 10,000 Chinese are packed together in a space where 1,000 whites would be asphyxiated. This again leads to other evils, and especially to a low state of morals,

which is perhaps the chief objection to the free admittance of Chinese immigrants in European colonies. Emigration has hitherto been directed mainly to the Eastern Archipelago, Indo-China, and the Malay Peninsula, where the Chinese labourers compete successfully with the indolent native populations. The national name is Chûng-kûe-jin, "people of the middle kingdom," where *Jin* (people, men) appears to belong to the same root as Chîn. China, already occurring in Sanscrit writings, and known to the ancients in the form of *Sinæ* through the old Persian Sîn. Exaggerated statements have long been current regarding the population of China, which has been estimated as high as 500 or even 600 millions. No real census has ever been taken, but estimates have been made, based on official data, showing 414 millions for 1842, 420 millions for 1852, and 404 millions for 1890. Kreitner, who studied the question on the spot, regarded these figures as much too high, and reduced them to about 150,000,000. Other unofficial calculations give 350 and 280 millions, and an impression now prevails that the population of China is about the same as that of British India in its widest sense, say 270,000,000. For the uncivilised non-Chinese populations *see* MIAO-TSE.

China Aster (*Callistephus chinensis*), an annual composite plant, a native of China, with an erect branched stem, scattered, sessile, toothed leaves, and large showy terminal heads of strap-shaped or tubular florets, white, pink or violet in colour. Each head has several rows of spreading leafy bracts with lobed margins and a slightly convex receptacle. Being hardy, free-flowering, and showy, the plant has become a favourite with gardeners.

China Sea, the portion of the Pacific bounded on the N. by Formosa, N.W. by China, W. by Anam and the Malay Peninsula, S.E. by Borneo, and E. by the Philippine islands, is divided into the three parts—Yellow Sea, Eastern China Sea, and Southern China Sea. It is subject to typhoons, and haunted by pirates. It is also full of islands.

Chinch Bug, a small North American bug (*Blissus leucopterus*), which does enormous damage to corn crops. It belongs to the order HETEROPTERA.

Chinchilla, a name for two genera of South American rodents, forming, with the Viscachas, the family Chinchillidæ. The true Chinchillas (*Chinchilla lanigera* and *C. brevicaudata*), from the Andes of Chili and Peru, are active squirrel-like animals, with silvery grey fur marbled and tinged with black. This fur is in much request, and to obtain it thousands of these rodents are trapped every year. The Alpine Chinchillas (*Lagidium cuvieri* and *L. pallipes*) are much larger; they resemble the hare in form, and the fur is ash-grey. The last-named species has a more northerly range than any of the others. [VISCACHA.]

Chindwara, a town of India in the central provinces, and capital of a district of the same name, is situated at an altitude of 2,200 feet and is a European health resort. The district covers an area of nearly 4,000 square miles.

Chinese Language, the most important member of the Isolating group, the other chief members of which are Tibetan, Annamese, Shan (Siamese, Lao), Burmese, and all other Indo-Chinese tongues, except Cham and Khmer (Cambojan). These languages are commonly called monosyllabic, and till recently it was supposed that they consisted exclusively of monosyllables, thus representing the most primitive and least developed type of human speech. Now it is known that monosyllabism is not a primitive, but an advanced state, resulting from profound phonetic decay, of which Chinese and its congeners afford the clearest evidence. Thus the Chinese *i* = "doubt" was originally *tadaka*, a word of three syllables; and so with the whole language, which by this process of decay has been reduced to a limited number (about 1,600) of monosyllables wrongly called roots, whole groups of which necessarily resemble each other in sound, but are distinguished chiefly by their intonation. To understand this let a group of five words, such as baka, bada, bama, basa, bafa, be all worn down to bak, bad, bam, bas, baf, and finally to the single sound ba; it then becomes obvious that this *ba* must have five different meanings, which, in the spoken language, could not be distinguished unless uttered with five corresponding tones. Thus tone, introduced to distinguish the meaning of countless homophones, becomes an all-important feature, and it would be better to call these languages *tonic* than monosyllabic. They are, however, correctly enough called isolating, because each word stands apart (isolated) in the sentence, in which its relation to the other words is determined, not by inflection or change of form, of which it is incapable, but by its position, as in such English sentences as John strikes James, James strikes John. Hence, in Chinese, almost everything depends on tone and position, beyond which there is little grammar or syntax. There are other expedients for distinguishing homophones, the most important being the juxtaposition of two synonyms, one fixing the sense of the other, as if the English word *road* were distinguished from its homophone *rode* by the addition of *way* (road-way). Such compounds are frequent in Chinese; but the process is clumsy compared with the tonic system, which has accordingly acquired an immense development in all the isolating languages. In the standard Mandarin language, as it is called, there are five tones, which are really insufficient, and hence are largely supplemented in the numerous provincial dialects. Some have as many as twelve or fourteen, which Europeans have the greatest difficulty in mastering, and as the least mistake in a tone causes misunderstanding, Chinese is little used for international intercourse. In the free ports it has been replaced by the so-called "pigeon English," *i.e.* "business English," a kind of jargon or *lingua franca*, in which most of the words are English and the form of expression Chinese.

Chinese is written in what are called "hieroglyphics," a better name for which would be "ideographs." They are symbols not of sounds, but of ideas; hence each character represents a

word, or rather a thought, and will be pronounced differently according to the vernacular of each reader. The ciphers 1, 2, etc., are ideographs equally intelligible to all Europeans, though pronounced differently by the English, French, Germans, etc. There are altogether over 43,000 of these signs, which, although not more than a tenth are in common use, form the greatest obstacle to the Chinese student and to the progress of learning in China itself. They are developed from 214 "tribunals" ("keys" or "radicals"), and are usually written in vertical columns from right to left, so that the first page of a Chinese corresponds to the last of an English book.

Chinese White, a pigment of very common use, commercially consisting of the oxide of zinc, ZnO.

Chingalpat, a town of India, and capital of the district, captured by Clive in 1752. It is 36 miles from Madras, and 15 miles W. from the Bay of Bengal. The district covers an area of 2,842 square miles. It is a flat country, with soil generally poor. Its coast line extends over 100 miles, yet does not present a single harbour.

Chin-kiang, a treaty port of China in the province of Kiangsu, situated on the right bank of the Yangtse Kiang, near its junction with the Grand Canal. It was opened to foreign trade in 1861.

Chinooks, a North American people of British Columbia and Oregon; they were formerly numerous about the Lower Columbia, but are now greatly reduced, and some have removed to the Chehalis reserve, Washington; chief divisions: Skilloots and Watlalas (Upper Chinooks); Wakiakums, Cathlamets, Clatsops, Calapooyas, Clackamas, Killamooks (Lower Chinooks). Their speech is said to be allied to the Aht of Vancouver's Island, noted for its extreme harshness and now little spoken. But it has served as the basis of the so-called "Chinook Jargon," an international *lingua franca*, which in recent years has acquired an extraordinary development throughout Oregon and British Columbia, a region where a multiplicity of languages had hitherto been a bar to general intercourse. This "Oregon Trade Language," of which a manual has been published by Mr. Horatio Hale (London, 1890), borrows its elements from Chinook, Nootka, French and English, besides a number of words formed by onomatopœia and composition. It has its own structure and grammatical laws, to which all loan words must conform, and it thus presents special interest to philological students, as throwing light on the evolution of all speech.

Chintz (a word of Hindu origin), a highly glazed calico upon which designs in different colours are printed, generally upon a white or light ground. In Persia gold is employed as a foil or ornamentation among the colours. Chintz is especially fitted and is chiefly used for curtains, bed-hangings, and the like, as its highly-glazed surface does not harbour dust. A somewhat similar substance is called cretonne (q.v.), but this is of thicker material and unglazed.

Chioggia, a town of Italy, situated on one of the lagoon islands of the Adriatic. Communication with the mainland is kept up by a stone bridge of 43 arches. The town is built on piles, and has some handsome edifices. Its harbour is fortified, and the industries include shipbuilding, lace-making, and fishing.

Chios (mod. *Chio* or *Scio*), an island lying about 7 miles distant from the coast of Asia Minor, and opposite to the peninsula that divides the Gulf of Smyrna from that of Ephesus (Scala Nova). It is crescent-shaped, with the concave side facing W. Its length is 32 miles, and its greatest breadth 18 miles, the area being about 400 square miles. The northern half is mountainous, but all the valleys and the more level ground to the south are exceedingly fertile, producing wine, fruit, cheese, figs, and gum mastic in abundance. From the free growth of the latter product the Turks call Scio *Saki Adassi*, or Isle of Mastics. It is one of the most favoured spots in the Greek Archipelago. The primitive Pelasgian race was early supplanted here by Ionian settlers, and Chios claims along with many other localities to have given birth to Homer. Among its distinguished sons were Ion, the tragedian; Theopompus, the historian; and Bupalus and Anthermus, the sculptors. It was the first state in Greece where domestic slavery, as distinct from serfdom, prevailed. Early possessed of a navy, the island was for a time forced to send a contingent to the Persian fleet, but after the defeat of Xerxes, attached itself to Athens, remaining on the whole faithful, with the exception of two revolts, until the establishment of Lacedæmonian supremacy. Later on Chios became part of the dominions of Alexander, passing next to the kings of Pergamus, and becoming the ally of Rome in the war against Philip. In revenge for assistance furnished to Mithridates it was made a province of Rome, and followed the fate of the Eastern Empire. Held successively by the Venetians, the Crusaders, and the Byzantine Emperors, during the twelfth and thirteenth centuries, it was in the hands of the Genoese from 1329 until its final conquest by the Turks in 1594. It continued to prosper until 1821, when an attempted revolt against the Mohammedan yoke led to the massacre of some 40,000 inhabitants, a blow from which it has never recovered, especially as in 1881 nearly 8,000 more were destroyed by an earthquake.

Chipmunk, the North American name of any species of Tamias, a genus connecting the True Squirrels with the Marmots. They are pretty little animals, clothed in light fur with darker stripes, and the Common Chipmunk (*T. striatus*) has also stripes of white. These animals have large cheek-pouches and burrow in the earth, whence they are known as ground squirrels. In these burrows they lay up stores of nuts and grain as a provision for the intervals of their imperfect hibernation. The single Old-World species *T. asiaticus* is found in North-eastern Europe and the north of Asia.

Chippewayans, a North American people, forming the central and most important division of

the widespread Athabascan family. [ATHABASCANS.] Their domain extends in all directions round Lake Athabasca, where the Hudson Bay Company's Fort Chippewayan is their chief meeting-place. They are of a quiet, inoffensive disposition, and most of them are employed by the company as trappers, carriers, and in other capacities. Chippewayan, which in Algonquin means "pointed coat," is the name given them by their Cree neighbours; but they call themselves Tinney, *i.e.* "Men" in the Athabascan language. Their tribal divisions are very numerous, and the so-called Beavers, Dogribs, Strongbows, Sheep, Red Knives, Hares, Slaves, Brushwood, and Horn Mountains, are all Chippewayans; in fact, all the tribes between the Rocky Mountains and Hudson Bay, as far south as the Churchill river and Methy portage, are members of this group.

Chippeways (Ojibways), a large Algonquin nation of Upper Canada and Michigan, forming, with the Crees, Montagnais of Labrador, and a few others, Schoolcraft's Nipercinean (fourth) branch of the Algonquin family. The Chippeways, who still number about 12,000, have all abandoned the chase, and have in other respects largely conformed to civilised ways. They are chiefly occupied with agriculture, and support a number of schools, where both Chippeway and English are taught.

Chiquinquira, the large town of the department of Boyaca, Colombia, South America, near the river Suarez, and 30 miles from the capital, Tunja. In primitive times it was a spot venerated by the natives, and the Spanish invaders discovered there a miraculous image of the Virgin, which to this day attracts every year thousands of pilgrims.

Chiretta, an infusion and tincture included in the British Pharmacopœia. It is an aromatic bitter, very similar in its action to gentian. It is compatible with iron, and the chiretta preparations are sometimes prescribed in such combination. It is prepared from *Ophelia chirata*, a gentianaceous plant of India.

Chiriguanos, a large South American nation, forming an important branch of the great Guarani family [GUARANI]; they inhabit the plains west of Gran Chaco, near the foothills of the Western Andes, between the Pilcomayo and Vermejo affluents of the Paraguay river. The Chiriguanos take a conspicuous place in the records of the early Spanish settlers, and they are still practically independent of the Argentine government. They are a fine, manly race, tall and well-proportioned, of a light coppery complexion, with dark eyes and very long black hair. They have attained a relatively high degree of civilisation. Their women are described by M. de Moussy as the most courteous and agreeable of all native women (*Description de la Confédération Argentine*, vol. ii. p. 184).

Chirimoya, or CHERIMOYER (*Anona Cherimolia*), a fruit native to Ecuador, closely related to the sweet and sour sop and custard apple of the West Indies, and considered by Creoles the most delicious fruit in the world. It is heart-shaped and scaly externally.

Chiriqui, the name of a province, a river, a lagoon, an archipelago, and a volcano in the state of Costa Rica, Central America. The province extends from coast to coast across the isthmus, and has an area of about 4,000 square miles. The river flows from S. to N., and enters the lagoon, which stretches for 90 miles along the coast, and affords anchorage for the largest vessels, being shut in from the Caribbean Sea by the archipelago. The volcano is situated in the W. of the province.

Chirograph, an instrument of gift or conveyance attested by the subscriptions and crosses of the witnesses. Anciently the chirograph was engrossed twice on one piece of parchment, contrariwise, leaving a space between in which was written in large words "Chirograph," and then the parchment was cut in two through the middle of the word, and a part given to each party. The first use of chirographs was in Henry III.'s time.

Chiron, according to Greek legend, was one of the Centaurs, the son of Chronos and Philyra. He lived in a cave under Mount Pelion, and was renowned for his skill as an archer and a musician, but still more so for his knowledge of the healing art. He was the instructor of Achilles, Hercules, Æsculapius, Ulysses, Nestor, and many others. Having received an incurable wound in the knee from a poisoned arrow shot by Hercules, he begged Zeus to relieve him of his painful immortality, which was conferred on Prometheus, he himself being translated to the stars as Sagittarius.

Chiroptera. [BAT.]

Chiru (*Panthalops hodgsoni*), a gregarious antelope from the highlands of Western Thibet and, perhaps, Turkestan. It is about three feet high at the shoulder, reddish fawn above, and white below, the nose and face are black, and there is a dark band down the front of each leg.

Chislehurst, an extensive parish and village in the county of Kent, 9 miles S.E. of London, on the South Eastern Railway. Occupying with its offshoot West Chislehurst the picturesque slopes that culminate in a broad common 300 feet above the sea-level, the locality has become of late years a favourite residence for the better class of City men, and numbers of handsome villas have sprung up in the neighbourhood. Camden House, close to the common, afforded a refuge to Napoleon III. after his fall in 1870, and here he died in 1873.

Chiswick, a village in Middlesex, standing on the N. bank of the Thames, $4\frac{1}{2}$ miles from Hyde Park Corner, on the South Western and District Railways. The neighbourhood has always been celebrated for gardens and orchards, the Royal Horticultural Society formerly being established there. Chiswick House, the seat of the Duke of Devonshire, where Fox died in 1806, and Canning in 1827, is chief among the many handsome suburban residences that were built here in the last century, but the ground is rapidly becoming covered by

streets of humbler houses. The Chiswick Press, a well-known printing establishment, was started here by Whittingham in 1811.

Chitaldrug, CHITALDURG, or CHITTELDROOG, a town and fortress in Mysore, S. India, stands 128 miles N. of Seringapatam. Occupied by a British garrison it is considered one of the strongest positions in Mysore territory. The town is walled, and lies below the fortress.

Chitin, a nitrogenous substance found in the skeletal tissues of many invertebrate animals. It is chiefly obtained from the shells of crabs, lobsters, or other crustaceans by dissolving out the mineral portion by hydrochloric acid. Its composition appears to be represented by the formula $C_{15}H_{26}N_2O_{10}$.

Chiton, the best known of those simple types of the Gastropods known as the ISOPLEURA, which are elongated forms retaining the primitive bilateral symmetry lost in all other Gastropods. In *Chiton* the nephridia and genital ducts are paired and bilaterally symmetrical, and thus retain a trace of a possibly original segmentation. The ctenidia or gills support this idea, as they are present in sixteen pairs. The shell consists of a series of overlapping plates on the dorsal side of the body: the microscopic structure of these plates is somewhat complex. The radula or the toothed-tongue, with which it obtains its food, is well developed; it thus differs markedly from its allies *Chætoderma* and *Neomenia*. In addition to the ordinary eyes there are many simple eyes on the dorsal surface. *Chiton* is an old genus, dating from the Carboniferous. It is common round the English coasts, creeping over rocks by its broad flat foot.

Chittagong, the name of a division, a district, and a port in British India, under the jurisdiction of the Lieutenant-Governor of Bengal. The division has an area of 12,118 square miles, and comprises the districts of Chittagong, Noakhali, Tipperah, Chittagong Hill Tracts, and Independent Hill Tipperah. The district occupies a strip of low-lying land on the coast of the Bay of Bengal beyond the Brahmaputra river. It is 165 miles long, and has an average breadth of 50 miles, being bounded by Tipperah N., Burmah E. (separated by lofty mountains), Arakan S., and the sea W. Flat near the coast the land rises in the interior to the height of 8,000 feet. It is generally fertile, but is to a large extent covered with forests abounding in tigers, elephants, rhinoceroses, leopards, and deer. The climate is not excessively hot, but a long rainy season and heavy dews render it very unhealthy. The chief river is the Karaphuli, navigable by large vessels up to the town of Chittagong, the Halda and the Sangu being also accessible to boats. Rice, cotton, bamboos, sugar, betel-nuts, tobacco, hemp, and mustard are the principal products. The territory was ceded to Great Britain in 1760 by Nawab Mir Kasim. The half-caste descendants of early Portuguese settlers form an element in the Christian population, but the bulk of the natives are Mussulmans. The town or port of Chittagong, also known as Islamabad, stands on the right bank of the Karaphuli, at a distance of twelve miles from its mouth. It consists of an agglomeration of villages, extending over nine square miles. The trade, still considerable, has declined somewhat of late. Shipbuilding is actively carried on, but the climate is a great bar to the growth of its commercial prosperity.

Chittagong Hill Districts, with an area of 6,882 square miles, occupy the eastern frontier of the division, and were separated from Chittagong in 1860. The hills, covered with dense jungle, are broken up by four great valleys formed by the Karaphuli, Sangu, Pheni, and Matamuri rivers, and are further intersected by ravines and watercourses. The chief hill tribes are the Kyonugthas, Chakmas, Tipperahs, Kumis, Khyengs, Bangis, Lushais or Kakis, and Shendus. They occasionally give great trouble to government, and are wild and uncivilised, though they contrive to float some amount of produce down the torrent streams to the coast. A large proportion of them are Buddhists, but many cling to local forms of superstition. The village of Rangamati is the capital of the district. Of late years European tea plantations have been established on some of the slopes.

Chiusi (anc. *Clusium*), a town in the province of Siena, Tuscany, Italy, stands on a hill close to a lake bearing the same name. It was Porsenna's capital and one of the twelve cities of the Etruscan Confederation. Consequently large numbers of vases, mirrors, bronzes, and other interesting traces of that extinct race have been found here. A place of some importance in the Roman period, it declined in the Middle Ages, the spread of the neighbouring marshes causing malarial fever. These have now been drained, and the population is increasing.

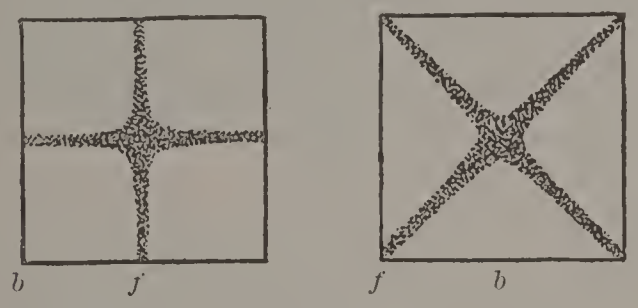
Chivalry, a word having reference to mediæval knighthood, may mean the general body of knights, as when the poet tells us how the English army "met France and all her chivalry in the valley of Poitiers," or, as is more usual, may denote the set of principles which were supposed to animate the knight. Bravery, truth, love of honour, devotion to woman, were its leading features. Sir Galahad, Sir Lancelot, the Chevalier Bayard, were examples of the chivalrous knight. In later times it came to signify a lofty and generous self-devotion, such as that shown by Sir Philip Sidney, and although Burke lamented in the 18th century that "the age of chivalry is gone," our modern life is not unacquainted with the quality. General Gordon, for example, may well rank with those mentioned above. The term is also used in ancient English law to denote tenancy by knight-service. The Court of Chivalry of Edward III.'s time took cognisance under the Earl Marshal of questions of honour, and, under the Earl Marshal together with the Lord High Constable, might deal with criminal cases.

Chive (*Allium Schœnoprasum*), a British species of onion with small slender bulbs and dense tufts of thread-like, awl-shaped leaves, six or eight inches

long, largely grown in Scotland as a spring salad or seasoning for soups.

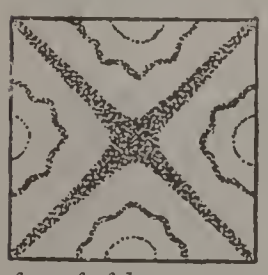
Chladni, Ernst Florens Friedrich, was born at Wittenberg in 1756. Brought up as a lawyer, he devoted much attention to music, and having a knowledge of mathematics and physics, was led to investigate the theory of sound. He discovered the laws of vibration, and was the first to notice the figures formed by fine sand on a sheet of glass in response to the vibrations of a violin bow. He also invented the enphone and the clavicylinder. His scientific works were numerous, the principal being his *Discoveries on the Theory of Sound* (1787) and his *Treatise on Acoustics* (1802). He also wrote on meteors. His death took place at Breslau in 1827.

Chladni Figures, in *Acoustics*, a convenient method of illustrating the vibration of plates or membranes. If a square brass plate be clamped in a horizontal position at its mid-point, and be



CHLADNI FIGURES.

covered with a thin layer of fine sand, its vibrations under varying conditions may be exhibited by the disposition of the sand, the particles being shaken from the vibrating parts of the surface on to the non-vibrating parts or *nodes*. Vibration of the plate is usually induced by drawing a well-resined bow across any definite point on the edge of the plate. The positions of the nodes are varied by placing one's finger at various points round the edge. In the sketch the plate is supposed to be bowed at *b*, and the fingers applied at *f*. The sand is shown at the nodal lines. If lycopodium powder be used instead of sand, it will accumulate at the middle of each vibrating segment instead of at the nodes. This is due to the disturbance of the air in the immediate neighbourhood of the plate, and to the lightness of the powder.



f f f b

CHLADNI FIGURES.

Chlamydophorus, a genus of Edentate Mammals, with two species, closely allied to the Armadillo (q.v.). *C. truncatus*, the Pichiciago, from La Plata, is about six inches long, and mole-like in habit. The armour, which is only attached to the back immediately over the spine, consists of twenty-four leathery bands, composed of geometrical plates or scales, and the lower edges are fringed with silky hair. The eyes, ears, and mouth are small, and the latter is furnished with eight molars on each side, above and below. In *C. retusa*, a somewhat larger form from Bolivia, the armour is adherent over the whole of the back. In both the hind parts are protected by armour, and the under surface is covered with long hair.

Chlamydosaurus, a genus of Iguanidæ, with one species (*C. kingii*), from Australia. "It has a curious membrane like a ruff or tippet round its neck, covering its shoulders, and when this is expanded . . . it spreads five inches in the form of an open umbrella."

Chlamys, a short, light mantle in use among the ancient Greeks, and adopted to some extent by the Romans. In form it had three straight sides, and one curved, and was generally arranged with the two squared sides brought together on the shoulder and fastened by a brooch. Ancient statues and carvings show many different modes of letting the folds hang.

Chlopicki, Joseph, was born in Galicia or Podolia in 1772, and entered the French army about 1796, rising to the rank of General. He took an active part in the Russian campaign of 1812. After the fall of Napoleon he transferred his services for a short time to Russia, but soon retired. In 1830 he was chosen Dictator by the revolutionary Poles, but his want of impetuosity displeased his colleagues, and at the end of a few weeks he resigned. He then served in the ranks, and was wounded. He survived until 1854.

Chloral, a colourless pungent liquid, boiling at 99·6°, sp. gr. 1·5, was first prepared by Liebig by passing chlorine gas into absolute alcohol. In composition it is closely allied to aldehyde, consisting of trichloraldehyde, CCl_3CHO. With water it forms a compound *chloral hydrate*, $CCl_3CHO + OH_2$, which crystallises in small tablets of the monoclinic system. Chloral is a rapid and powerful hypnotic, and while far inferior to opium in that it does not relieve pain, its employment is admissible in some cases where opium is contra-indicated. Its action is distinctly depressant, and it requires to be used with great caution; in patients suffering from organic disease of the heart, lungs, or kidneys, its administration may be attended with danger. The chloral habit is acquired by those who repeatedly have recourse to the drug for its sleep-giving properties; this condition is less common than the analogous morphia habit. The fact that it does occasionally occur is unquestionable. It is consequently extremely undesirable to administer chloral as a matter of routine in the treatment of sleeplessness. In chloral poisoning there is deep narcosis, accompanied by coldness of the skin, especially of the extremities. In the treatment of such cases loss of heat should be prevented by enveloping the patient in warm blankets; constant efforts should be made to rouse him, as in the case of opium poisoning; warm coffee is valuable for its stimulant action. The syrup of chloral of the British Pharmacopœia contains 10 grains of chloral in 1 fluid drachm, which is an average dose for an adult. A mixture of equal parts of chloral and camphor is valuable as a local application in certain forms of toothache.

Chlorates are the salts of chloric acid, $HClO_3$. The acid itself is a colourless liquid which can only be obtained in solution. It is a powerful oxidiser, and organic bodies at once decompose it. The salts are all soluble in water. Potassium chlorate is the most important. This salt crystallises in large monoclinic tablets, which emit light if rubbed. It is prepared by passing chlorine through a warm solution of caustic potash, the reaction being represented by the equation

$$3Cl_2 + 6KOH = KClO_3 + 5KCl + 3OH_2.$$

The chlorate is separated from the potassium chloride, also formed by crystallising. Other chlorates are prepared in a similar manner. Potassium chlorate is used for the preparation of oxygen gas, as an oxidiser, and in pyrotechny. It is also employed in calico printing, and in the manufacture of safety matches. It is used for medicinal purposes, and chlorate of potash lozenges are largely sold for relieving inflammation of the throat.

Chlorides are the salts of hydrochloric acid, HCl, and may be represented by the formula MCl where M is a monobasic element. They are generally formed by dissolving the metal or its oxide in the acid. Many may be prepared by direct union of the metal and the gas. Thus antimony takes fire if sifted into chlorine gas forming the chloride $SbCl_3$. With the exception of lead, silver, and mercurous chlorides ($PbCl_2$, AgCl and HgCl) they are all soluble in water. Many of them are very important commercially or chemically. Ordinary common salt consists of sodium chloride, NaCl. Calcium chloride, $CaCl_2$, is largely employed for drying gases, and barium chloride, $BaCl_2$, is an invaluable chemical reagent. Zinc chloride, $ZnCl_2$, is used as a desiccator and antiseptic, and its solution forms Burnett's disinfecting liquid. Chloride of gold, $AuCl_3$, is largely used in photography, and platinum tetrachloride. $PtCl_4$, in chemical analysis. The two chlorides of mercury, HgCl and $HgCl_2$, known respectively as calomel and corrosive sublimate, are also largely employed in medicine. Ammonium chloride, NH_4Cl, forms the sal-ammoniac of commerce. The compounds of chlorine with non-metals or with organic radicals are also called chlorides, as nitrogen chloride, NCl_3, ethyl chloride, C_2H_5Cl. Most of these are of great theoretical interest, and many of industrial importance.

Chlorimetry, the estimation of free chlorine present in a substance; especially the determination of the available chlorine of bleaching powder. Most chlorimetric processes consist in the volumetric measurement of the quantity of a standard solution of some reagent which can be oxidised by a known weight of the substance. This is the case with Bunsen's and Penot's methods. A ready method also is to estimate the volume of oxygen liberated from hydrogen peroxide, in which case by the use of a right weight of the substance each cubic centimetre of oxygen indicates 1 per cent. of chlorine present.

Chlorine (Cl., atomic weight 35·37), a gaseous element which does not occur free in nature, but, combined with other elements, occurs largely in sea water, and beds of mineral salts. It is chiefly prepared by the action of hydrochloric acid on manganese dioxide,

$$MnO_2 + 4HCl = MnCl_2 + 2OH_2 + Cl_2.$$

It is also largely prepared by passing hydrochloric acid gas and air over heated bricks impregnated with copper sulphate,

$$4HCl + O_2 = 2OH_2 + 2Cl_2,$$

the copper sulphate undergoing no change (Deacon's process). It is a greenish gas (hence its name *chlōros* = green) with a very disagreeable suffocating smell. When strong it is a violent irritant, causing inflammation of the mucous membrane of the throat. By pressure and cold it can be condensed to a yellow liquid. It is soluble in water, but is evolved on warming the solution. Many metals burn in chlorine, and it acts energetically on many organic substances containing hydrogen. When moist it possesses the power of bleaching vegetable colours, but the dry gas has not this property. It has also antiseptic properties, which, like the bleaching, appear to depend on its oxidising power. It is largely used for the preparation of bleaching powder and other manufacturing purposes, and its solution is much employed in the chemical laboratory. Together with bromine, iodine, and fluorine, it constitutes the group of elements known as the Halogens (q.v.).

Chlorite, a hydrous silicate of magnesium, aluminium, and iron, forming a dark olive-green, nearly opaque, pearly mineral of common occurrence. It crystallises in the hexagonal system in non-elastic laminæ, and forms the bulk of the rock *chlorite-schist*. It fuses with difficulty, but gives off water, and is far softer than hornblende. Hardness = 1·5; specific gravity = 2·6 to 2·8. Chlorite is essentially an alteration-product in rocks of igneous origin. [METAMORPHISM.]

Chlorodyne, a patent medicine which has acquired a reputation mainly as an astringent and hypnotic. Its composition is practically the same as that of the *tinctura chloroformi et morphinæ* of the British Pharmacopœia. The dose is 5 to 10 minims for an adult. Both these preparations contain very powerful ingredients, and must be used with caution.

Chloroform, a colourless mobile liquid, boiling at 62°. It was discovered by Liebig in 1831, and is generally prepared by distilling a mixture of bleaching powder, water, and alcohol, and purifying the crude product. The mixture is warmed in a large still until the chloroform begins to distil over, and the action continues without further application of heat. The composition is represented by CCl_3H. In England "methylated spirit" (alcohol containing 10 per cent. wood naphtha) is largely used for its preparation, owing to the high duty on absolute alcohol. The product is known as "methylated chloroform," and does not appear to differ from that prepared from pure

spirits. It may be obtained in a state of purity by the action of caustic soda on chloral hydrate,

$$CCl_3CHO+OH_2+NaOH=HNaCO_2+OH_2+CHCl_3.$$

It has a sweet taste; taken internally it acts as a stimulant, and the inhalation of the vapour produces anæsthesia. It is hence largely used medicinally, and in surgical operations. It is also employed as a solvent for caoutchouc and many organic substances which are insoluble in water, alcohol, and the ordinary solvents. For the use of this drug as an anæsthetic, *see* ANÆSTHESIA. The following preparations of chloroform are included in the British Pharmacopœia:—*Aqua chloroformi*, dose 1 fluid ounce; *linimentum chloroformi* useful as a local anæsthetic; *spiritus chloroformi*, dose $\frac{1}{2}$ to 1 fl. drachm; *tinctura chloroformico*, dose 10 to 30 minims, and *tinctura chloroformi et morphinæ*, dose 5 to 10 minims. The *aqua*, *spiritus*, and compound tincture are mainly used in combination with other drugs in the treatment of dyspeptic conditions. The *tinctura chloroformi et morphinæ* is useful in certain forms of diarrhœa, and as a hypnotic.

Chlorophyll, the green colouring matter of the leaves and young stems of plants, a substance of great physiological importance. In the lowest algæ, such as the *Protococcaceæ* and the "gonidia" of lichens, it exists diffused throughout the protoplasm. In *Spirogyra* it colours spiral bands of the protoplasm only; in *Zygnema*, stellate masses; and in other *Conjugatæ*, portions of other forms; but in higher plants (exclusive of all fungi and of a few parasites and saprophytes among flowering-plants in which it is absent) it colours certain differentiated granules of the protoplasm known as *chloroplastids*. These are formed independently of the action of light; and in the leaves of ferns and the cotyledons of gymnosperms, if the temperature be high enough, they become green in the absence of light. Normally, however, *i.e.* among angiosperms, they are either colourless (in the absence of iron) or coloured yellow by *etiolin* (in its presence) until exposed to light. For the development of their green colour they require (1) light of moderate intensity, especially the yellow end of the spectrum, (2) heat, approximating to an *optimum* temperature between 25° and 30° C., and (3) iron. The chemical composition of chlorophyll is not certainly ascertained, but it contains carbon, hydrogen, nitrogen, oxygen, and perhaps phosphorus and iron. It is insoluble in water, but in alcohol, ether, or benzol yields a bright green solution having a brilliant red fluorescence (q.v.). It gives an absorption spectrum with seven bands, four narrow between the red and the green and three wide ones at the blue end. Many observers consider this spectrum to indicate two distinct colouring-matters, one yellow and the other blue-green. In the absence of iron the green colour is not produced, but it is quickly assumed on the plant being watered with a solution of iron. Chlorophyll-granules multiply by division, and seem interchangeable with the colourless *leucoplastids* formed in the dark, and with the variously-coloured *chromoplastids* of ripening fruits, which contain various crystalline colouring-substances. Chloroplastids are few in number in the epidermis, but occur especially in the "palisade-tissue," or hypoderm of the leaf, and in the *phellodcrm*, a layer of the primary cortex of the stem. The function of chlorophyll is to bring about the decomposition of the carbon-dioxide of the air absorbed by the plant, liberating an equal bulk of oxygen to that in the absorbed carbon-dioxide. This process, known to vegetable physiologists as "assimilation," is also termed the *chlorophyllian process*, and, as the source of practically all the carbon in the organic world, is a nutritive process (not respiratory) of primary importance. This process only goes on in the presence of light, preferably the less refrangible rays. It is believed to consist in the formation of a glucose from the carbon-dioxide and the water taken in by the roots, the first visible result of it being the appearance in the chloroplastids of starch-grains which may originate from the glucose or grape-sugar by dehydration. [STARCH.] It is by the oxygen liberated in this process that green plants in daylight purify the air. Some protozoa, the fresh-water sponge, *Hydra viridis*, and some planarian worms form chlorophyll-corpuscles in their protoplasm, and are thus capable of feeding upon atmospheric carbon-dioxide, or, as it has been called, of aërobiosis, holophytic or autophytic nutrition, as if they were plants.

Chlorosis. 1. A serious constitutional defect, to which many different kinds of plants are liable. It consists in an absence of chlorophyll, a consequent pallid hue, and general weakness. It may occur in plants growing in abundant light, and seems most common in badly-drained soil and in cold, damp weather. It may arise from a deficiency of iron or potash, or from the attacks of moulds. [VARIEGATION.] The term has also been applied to the abnormal replacement of floral by green leaves, of which "green roses" are the most familiar instance.

2. CHLOROSIS, or "green sickness" (Gk. *chlōros*. green), is a form of anæmia or bloodlessness affecting young girls at the time of puberty. In cases of marked chlorosis there is a considerable diminution in the amount of the red colouring matter of the blood (hæmoglobin). The natural ruddy aspect of the countenance in health gives place to a wax-like pallor; the lips, gums, and conjunctivæ are unusually pale, and in extreme instances the face presents a distinctly greenish hue. Hæmoglobin (q.v.) is the great oxygen carrier of the blood. Hence deficiency of hæmoglobin, besides manifesting itself in the altered appearance of the patient, causes imperfect aëration of the tissues, and produces breathlessness. Again, an anæmic condition of the brain is well known to be one of the causes of headache; and thus the three cardinal symptoms of chlorosis (viz. pallor, shortness of breath, and headache) are all directly traceable to the altered condition of the blood. Other symptoms are frequently associated with the three already named. Dyspeptic troubles are common, and the occasional association of ulcer of the stomach with chlorosis

gives them considerable importance. Apart from the pain after food, vomiting, and hæmatemesis of gastric ulcer, it is, however, common for chlorotic girls to suffer from flatulence, loss of appetite, and constipation. Neuralgia is of frequent occurrence. Anasarca may be present in slight degree. The menstrual functions are generally disturbed. The monthly flow is commonly absent, but it may be excessive, and there is not unfrequently leucorrhœa. Auscultation of the heart frequently reveals a systolic murmur over the left base, and the pressure of the stethoscope on the veins of the right side of the neck usually readily evokes a peculiar continuous noise, known as the *bruit de diable*. Loss of flesh is for the most part conspicuous by its absence, but there is always impairment of energy and depression of spirits, and sometimes a markedly hysterical condition may be developed. The cause of the disease is obscure. Hæmoglobin contains iron, and the administration of iron in large doses is almost always followed by rapid recovery from chlorosis. Beyond this nothing certain can be said. As regards conditions predisposing to chlorosis, the subjects of the disease are young women usually between 15 and 25 years of age ; the immense majority of them work for long hours in a confined and ill-ventilated atmosphere, their food is often deficient in quantity or quality or both, and they almost invariably suffer from obstinate constipation. The treatment of the disease is, almost without exception, most satisfactory, provided the patient can carry out the directions given to her. Pure air, good food, the regulation of the action of the bowels, and the administration of iron in large doses ; these things granted, the recovery of the patient proceeds by rapid strides. Many girls are so habituated to a vitiated atmosphere in the workroom that they regard all attempts at ventilation with horror ; and most young women neglect any sort of regularity in the matter of the evacuation of the bowels. An endeavour should, therefore, be made to obtain some approximation to a compliance with ordinary hygienic teaching on these particulars. When dyspeptic symptoms are present, the subnitrate of bismuth is of service. A mild aperient is generally indicated, and a useful combination is afforded by a mixture of equal parts of the mixtura ferri composita and decoctum aloes compositum. Iron may be given in the form of Blaud's pill ; and reduced iron or the citrate of iron and ammonia are often employed.

Chlorospermeæ, one of Harvey's three primary divisions of algæ (q.v.), comprising the *Palmellaceæ*, diatoms, desmids, *Confervaceæ*, *Conjugatæ*, *Ulvaceæ*, etc., most of which are green, and have green reproductive bodies or zoospores.

Choate, Rufus, was born at Essex (then Ipswich), Massachusetts, U.S.A., in 1799. He was educated at Dartmouth college and the law school of Cambridge, and started in practice at Danvers, afterwards settling in Boston. He soon made himself a name as a powerful advocate. Elected to Congress, and later on to the Senate, he devoted himself for five years to public affairs. In 1845, however, he returned to his practice with great success, and was regarded as one of the ablest speakers in America. In 1858 his health broke down, and he died very suddenly at Halifax, whither he had gone on his way to Europe.

Chobi, a large Bantu nation, Gazaland, South Africa, of whom there are two divisions, the Chobi proper ("Bowmen"), along the left bank of the Lower Limpopo, and the Mindongs, or Northern Chobi of the Inhambane coast district. The former have been reduced by the Zulu invaders of Gazaland ; the latter have preserved their independence, thanks to the protection given them by the Portuguese. These Mindongs are the *boa gente* ("good folk") spoken of by Vasco da Gama (1498). They disfigure themselves with three rows of warty excrescences on the face ; one running from the forehead to the tip of the nose, the others in concentric circles from ear to ear by the upper lip and chin. A similar system of tattooing prevails amongst the neighbouring Transvaal tribes, whence the term Knob-noses applied by the English to all this group of aborigines.

Chocolate, a kind of paste formed by crushing and rolling very fine with water the seeds of the *Theobroma cacao*. These seeds or nibs when simply crushed and pounded form what is commonly known as cocoa, and when mixed with sugar, vanilla, cinnamon, or other spices, as chocolate. It is much used, more in southern than in northern countries, and particularly in the Spanish peninsula, and in Italy. In the latter country it is combined with coffee to form *mischiata*. Besides being employed as a drink, chocolate is formed into an edible paste flavoured with different materials. Most people are acquainted with it in this form, or in that of creams and ices. Containing much nitrogenous matter it is a supporting food, and a good flesh-producer. It contains naturally about 50 per cent. of fat, which amount may be reduced in the process of manufacture to suit varying tastes and needs. An Italian compound consisting of chocolate, milk, and raw egg, is a rich food, and is called *La Gloria*. The substance, like its name, was introduced from Mexico.

Chœropus, a genus of small Australian Marsupials, with a single species, *C. castanotis*. The slender fore-limbs end in two digits, whence the animal is sometimes called the Pig-footed Perameles. [Bandicoot.]

Choirs, a word generally used to signify organised bodies of church singers, but of late years considerably enlarged, as for example the Bach choir. Also, the part of a church at the east end in which the singers are seated. The efficiency of a choir depends upon many conditions, the chief being, 1st, that the voices be equally balanced ; 2nd, that the volume of voice and position of the singers be adapted to the size and form of the building in which they fulfil their functions ; 3rd, that the different members have a perfect aptitude for observing time and rythm ; 4th, that they be able to sing at sight ; and lastly, though by no means a least necessary condition, that they have much practice together. In most choirs there

is a conductor for the purpose of giving uniformity and coherence, though often, indeed generally, in the case of church choirs there is no conductor properly so-called, and the singers are kept together simply by means of the organ or other accompaniment. Again with church choirs it is a moot point whether they are more effective with or without an accompaniment. The latter practice, which requires a greater degree of skill, is in vogue in the Eastern Church. The choir at St. Petersburg consists of 120 men and boys. In the Roman Church it is usual to have an accompaniment, though the famous Sistine Choir at Rome dispenses with this aid. In some cases the choir only lead the congregation instead of being solely responsible for the music. This is the case in some degree in the Lutheran Church, where choir and congregation sing alternately, as for instance in the great church of Berlin, and in the church of St. Thomas at Leipzig, and in England there is in some parts a strong feeling in favour of what is called congregational singing. In English cathedrals much attention is paid to choral music, and the choir is generally endowed. That of Durham cathedral has an endowment of £2,400. Some of the choral part of the service is conducted antiphonally, the sides being called Cantoris and Decani from the respective positions of the dean and the precentor. Where there is a precentor he is responsible generally for the music, its selection, etc., while the organist is responsible for its execution, the training of the choir, and the arrangement of practices. Among the most notable of English choirs are those of New and Magdalen Colleges, Oxford, and that of the Middle Temple in London, while the music at the Italian church in Hatton Garden attracts many listeners.

Choiseul - Amboise. Étienne François, Duc de Choiseul et d'Amboise, was born in 1719, and as Comte de Stainville entered the French army, rising ultimately to the rank of general. Having won the good graces of Madame de Pompadour, mistress of Louis XV., he was named ambassador to Rome and Vienna, and in 1758 received the portfolio of foreign affairs with a dukedom. His influence with the king was unbounded. In 1760 he expelled the Jesuits from France. He is credited with having stirred up the British colonies to revolt, and with drawing up the Family Compact between the Bourbons in 1761. Resigning the foreign ministry to his cousin the Duc de Praslin, he took charge both of the military and naval departments, and in 1763 concluded the Treaty of Paris. After La Pompadour's death he ventured to show contempt for Madame du Barry, the new favourite, and therefore was driven from power in 1770. He spent the rest of his life at Chanteloup or in Paris, surrounded by a literary and artistic circle, and often consulted by the king on political affairs. Voltaire was one of his friends. He died in 1785, leaving no children. The memoirs attributed to him are not authentic.

Choiseul - Gouffier, Marie Gabriel, Comte de, was born in 1752, and visiting Greece in 1776, commenced the publication of his travels, a work which obtained him a place in the French Academy in 1784. He was sent as Ambassador to Constantinople, and was there at the outbreak of the French revolution, when, to avoid arrest, he took refuge at St. Petersburg, and was received with distinction. In 1802 he returned to France, and resumed his political and literary career. He died at Aix-la-Chapelle in 1817, and his interesting antiquarian collection may be seen in the Louvre.

Choke Damp, the name given to the carbonic acid gas which is found accumulated in coal-pits, wells, etc. After explosion of fire-damp (CH_4) in coal-mines large quantities of this gas are formed, and it is also called "after-damp." It does not support life [Carbonic Acid], and frequently in colliery explosions more deaths are attributable to it than to the explosion itself.

Choking. The impaction of a foreign body in the air passages gives rise to very alarming symptoms. The offending substance may be within reach and admit of removal by the finger; in the case of a child suddenly developing intense dyspnœa it may be necessary to promptly invert the body, holding the sufferer by the heels and striking him between the shoulders. The dyspnœa, due to the impaction of a foreign body in the orifice of the glottis, at once assumes its maximum intensity; it may prove immediately fatal, or may pass off for a time to be succeeded by recurring attacks of spasm until the obstructing substance is removed. In rare instances a foreign body may find its way into the trachea, or into a bronchus (usually the right bronchus). The surgeon can sometimes detect the intruding object with the laryngoscope, and remove it with laryngeal forceps, or it may be necessary to perform laryngotomy or tracheotomy. If the source of trouble be in the larynx, opening the trachea at once affords relief; it may be possible to remove a foreign body through the tracheotomy wound. Acute dyspnœa sometimes arises from spasm of the laryngeal muscles, caused by irritant vapours, or as in the disease known as *laryngismus stridulus*. This affection occurs in infants who are teething and are the subjects of rickets. In catarrhal inflammation of the larynx, dyspnœa may develop very suddenly; this is particularly the case with children. A "croupy cough" in a child is a symptom that admits of no delay in the procurement of skilled advice.

Choktaws, or Choctaws (Chaktas), a North American nation akin to the Chikasaws, who formerly occupied both banks of the Yazoo affluent of the Mississippi. In 1830 they surrendered to the United States Government their hunting-grounds in this region (about 10,000,000 acres) for a sum which appears never to have been paid. At present they are settled on a reserve in Indian Territory at the angle formed by the state of Arkansas with Texas limited N. by the Arkansas, S. by the Red River, about 6,690,000 acres, mostly under maize. The Choktaws, whose ancient culture is somewhat highly coloured by Chateaubriand in *Atala*, are still one of the most polished of all North American nations; they increased

from 12,500 in 1866 to 16,000 in 1872, and over 20,000 in 1890. The surplus of the tribal revenue is applied to the support of a large number of schools. [CHICKASAWS.]

Cholecystotomy, the operation of opening the gall bladder for the relief of biliary obstruction.

Cholera (Gk. *chole*, the bile). *Cholera morbus*, Asiatic cholera, or malignant cholera is a specific epidemic disease, the main symptoms of which are sudden collapse with vomiting and diarrhœa. *Cholera nostras*, or English cholera, is a term applied to the more severe sporadic cases of diarrhœa which occur in Great Britain in the summer months, quite apart from any visitation of the epidemic disease. *Cholera despoules*, or "fowl cholera." is an affection met with in poultry-yards, the symptoms of which bear some resemblance to the *cholera morbus* as seen in man.

History. The disease has probably existed for centuries in India. It particularly affects certain regions, as, for example, the delta of the Ganges. In such situations isolated cases of cholera occur from time to time, and, at length, when the conditions for spreading become favourable, an epidemic wave of the disease is developed, and the ravages of cholera extend and involve far distant countries. Such an epidemic was that which commenced in India in 1817, and then slowly extending wrought great havoc in the succeeding years in almost all parts of the globe. The dates at which epidemics have commenced in this country are as follows:— 1831, 1848, 1853, and 1865. In each instance the cholera was traceable to infected persons landing in seaport towns; the early attacks have usually occurred in the autumn of the year specified, and the epidemic, after smouldering through the winter, has burst forth and attained its greatest height, throughout the country, in the summer of the succeeding year, and has then entirely disappeared.

Causation. As regards the conditions which favour the development and spread of the cholera poison, it is clear that heat and climate have some influence in the matter; low-lying ground, too, is more often affected than places situated on an altitude. According to Pettenkofer, the height of the ground water plays an important part in determining outbreaks; he maintains that the cholera poison develops most malignantly where the soil is porous, and a rise in the level of the ground water has rendered it moist, and a subsequent fall has served to aërate it. Dr. Snow in 1849 adduced weighty evidence to show that the disease was spread by the contamination of drinking water with choleraic evacuations, and facts which seem to support this conclusion have been forthcoming ever since. Some authorities, however, still oppose this view. Suspicion having once settled on the cholera stools as the means of spreading the infection, attention was directed to a careful examination of the evacuations of patients, and many attempts were made to establish the existence of a cholera germ in the excreta. All previous efforts in this direction have been eclipsed by the discovery in 1884 of the *comma bacillus* by Robert Koch. Numerous observers have satisfied themselves that it is an almost invariable rule to find Koch's bacillus in the intestinal discharges of cholera patients; unfortunately, however, it has not hitherto been found possible to obtain very conclusive experimental proof of a cause and effect relationship between the bacillus and the disease.

Symptoms. After a short incubation period, in which some premonitory malaise and diarrhœa may be present, the actual attack of the disease is usually ushered in by intense purging. The evacuations quickly assume a thin, colourless, odourless character, to which the expression "rice-water stool" has been applied, vomiting is usually present, and the vomited matter after a while assumes the rice-water appearance. The loss of fluid by the diarrhœa and vomiting combined is very great, and quickly leads to a shrunken appearance particularly noticeable in the sunken eyes and shrivelled extremities. Intense muscular cramps are usually complained of, the temperature falls, and the patient is rapidly reduced to a condition of extreme collapse. Thus the initial stage passes into the so-called "algide stage" of cholera, in which purging and vomiting often cease, and the helpless victim of the disease lies cold and livid, and, in fatal cases, rapidly becomes comatose and dies. If the attack be a milder one, after some twenty-four hours or less a period of reaction sets in, temperature rises, the secretions become re-established, and a febrile condition generally ensues, from which recovery may either speedily or after some days' interval occur, or, again, the reactionary symptoms may lead to a fatal termination. The rate of mortality of cholera cases is always high: rarely less than 25 per cent., sometimes much more considerable.

Treatment. There is no known specific treatment of any avail in the disease. All that can be done is to treat symptoms as they present themselves. In the stage of collapse the injection of saline solutions into the veins has sometimes been attended with success. The treatment *par excellence* of cholera is preventive treatment. The improved sanitary conditions which have been brought about in Great Britain are held by the best authorities to have rendered the fear of a formidable epidemic a thing of the past. Cholera can obtain no hold upon a district which has a pure water supply, good drainage, and satisfactory hygienic surroundings. It is a wise precaution, if cases of the disease occur, to boil all water before use, and scrupulous disinfection of the excreta of patients and destruction of soiled clothing should be enforced. Quarantine is quite useless as a means of prevention if the conditions necessary for the spread of the disease exist; the most rigid quarantine will be powerless to prevent the introduction of the poison, and therefore powerless to prevent its diffusion. All cholera-infected vessels arriving in British ports are dealt with under an order of the Local Government Board which provides for medical inspection, isolation of declared and doubtful cases of the disease, and disinfection. Passengers who present no symptoms of the disease are allowed to proceed to their destination, their names and addresses being transmitted to the medical officer of the district for which they are bound.

Cholesterin, a monatomic alcohol having the formula $C_{26}H_{44}O$. It is a normal constituent of bile, in which fluid it is probably held in solution by the bile salts. Under certain diseased conditions cholesterin becomes deposited in the biliary passages, forming concretions known as gall stones. [CALCULUS.] Cholesterin is insoluble in water, soluble in ether or boiling alcohol; it crystallises in needles or in peculiar rhombic scales. Besides occurring in bile, it has been shown to be present in certain exudations, in disorganised eyes, in yolk of egg, and in certain plants. As obtained in an impure state from wool grease it is known commercially as *lanolin*, and is used in medicine to form ointments, etc., and also for the manufacture of cosmetics and pomades.

Cholet, a town in the department of Maine-et-Loire, France, on the right bank of the Maine, 11 miles S. of Beaupréau, which it has supplanted as capital of the arrondissement. It is the seat of an extensive manufacture of cotton and woollen fabrics, handkerchiefs, flannels, and paper.

Cholula, an old city of Mexico, once the capital of a small independent state, stands on the plateau of Anahuac or Puebla, 60 miles S.E. of Mexico, on the way to Vera Cruz, at an elevation of 7,000 feet above the sea. At the time of the Spanish invasion it was known as Chololan, and was the thriving centre of religion, possessing a noble temple of the god Quetzacoatl, built on a pyramid 160 ft. high; the spot is still venerated, being dedicated to the Virgin as the healer of sickness. In 1519 Cortez massacred and pillaged the city, which has now but a small population mostly of Indians.

Chondrin, a substance containing oxygen, hydrogen, nitrogen, and sulphur, but of unknown composition, which is obtained from cartilage by extraction with boiling water. It is uncertain, however, whether it really exists as such in the cartilaginous tissue. It resembles gelatine in many respects, dissolving if boiled with water, and gelatinising on cooling. Boiled with hydrochloric acid it yields a fermentable sugar.

Chondropterygii. [CARTILAGINOUS FISHES.]

Chondrus. [CARRAGEEN.]

Chontals, the aborigines of the extensive Chontales department, Nicaragua, commonly known by the name of Popoluca, which in Aztec means "foreigner" or "barbarian." They are everywhere retreating before the white and half-caste settlers to the recesses of the forest. But they have left evidence of their former presence in the numerous ruins, and especially burial places, met in all parts of the province. The graves, which appear to have been disposed in circles round about the old villages, are of all sizes; some about 20 ft. long by 12 ft. broad. In one was found a pillar 7 ft. high, with a millstone such as those still in use, a knife 10 in. long, a puma's head of natural size, and other objects all carved in stone, besides a quantity of potsherds. A great number of gold ornaments have also been found, as well as stone idols of great size, but no temples or other stone structures.

Chontoquiros, a Peruvian people in the Cuzco Mountains and Ucayali Valley, so called from *chonta*, a "stick," and *quiro* "teeth," because they stain their teeth black with a stick; but their real name is Sirieninche. Their language is quite distinct, having no affinity with any other, and Paz Soldan mentions the curious fact that the names of all members of the human body begin with the letter *r*.

Chopin, FREDERICK FRANÇOIS, was born at Zelazowa-Wola, Poland, in 1810, his family being of French origin. Through the generous help of Prince Antoine Radziwill he received an excellent general education, whilst his musical studies progressed under Elsher, the director of the Warsaw Conservatoire. In 1829 he made his *début* as a pianist at Vienna, and was already a complete and fully developed artist. Indeed, his artistic career shows none of the usual progressive stages; such as he was at the end he began to be from the first. Nurtured in aristocratic and cultivated society his genius never aimed at grandeur or popularity. He appealed to the delicate artistic sense, and somewhat artificial, if subtle, sentiment of a select audience. Thus he never attempted the higher forms of composition, but confined himself exclusively to impromptus, waltzes, mazurkas, fantasias, and songs, all designed for the pianoforte, if we except two concertos and a few concerted pieces of chamber music. His works are gems in their way, but they bear to the nobler and more natural productions of the great masters much the same relation as triolets and rondeaux to poetry. As a performer Chopin was unrivalled for absence of all garish display or noisy enthusiasm. Most of the effect was produced by fingering, and the tone throughout was subdued. In 1831 he went to Paris, which henceforth became his home. He fell under the spell of George Sand, who, when his health began to fail in 1837, took him to Majorca, and nursed him so carefully that his life was prolonged till 1849, in spite of the insidious attacks of consumption. He only visited England the year before his death. He may be said to have caught the wild native melody of the Slavonic races, and tamed it for drawing-room use. His art died with him. He has imitators, but he founded no school.

Chorale, in *Music*, a simple melody written as a psalm or hymn tune to be sung in chorus. The chorale had its origin with the Lutherans, who used it with very great effect. The famous "*Ein feste Burg*" has been used by Wagner, Bach, Mendelssohn, and Meyerbeer.

Chord, in *Geometry*, is the line joining any two points on a curve. The limiting position of this line, as one point is brought nearer and nearer to the other, is the tangent at this point. In the case of a circle any chord is bisected by the perpendicular on to it from the centre, and diminishes in length as its distance from the centre increases. Hence the greatest chords of a circle are its diameters, all passing through the centre, and all of equal length. Given the radius of a circle

and the length of chord subtending any angle at the centre, we may construct this angle. Thus, a *scale of chords* is sometimes used for marking off angles, though the *protractor* (q.v.) is better for the purpose. If two circles intersect, they possess a common chord, the line joining their two points of intersection. All tangents to the two circles from any point on the common chord are of equal length. If three circles intersect, there will be three such common chords or *radical axes* as they are termed. These three axes will invariably be found to pass through one point. In any conic section the mid-points of chords parallel to any diameter lie on a line through the centre of the conic parallel to the tangents at the extremities of the given diameter.

In the theory of sound a *chord* is understood to mean the simultaneous production of simple sounds in harmony with each other. The vibration-numbers for the constituent sounds must be in simple ratios, or else discordant effects are produced. Thus the notes C, E, and G, forming the *common* chord, have their vibration numbers in the ratio 4 : 5 : 6. In the minor key the ratios are slightly more complex, the faint suggestion of discord producing a favourable effect. There are very many different names given to particular chords, such as *common chord*, *diminished*, *augmented*, *chord of the dominant*, *of the sixth*, etc., etc.

Chorda dorsalis. [NOTOCHORD.]

Chordata, a phylum or branch of the animal kingdom, characterised by the possession of a rod (the notochord) underlying the central nervous system, and by visceral clefts, *i.e.* passages at the sides of the head or neck opening outwards. Either or both of these characters may be temporary or permanent. The Chordata are arranged in three groups:—1. Cephalochordata, of which Amphioxus (q.v.) is the only example. 2. Urochordata, with two subdivisions—(1) Perennichordata, in which the notochord is retained through life, as in Appendicularia (q.v.); (2) Caducichordata, in which the caudal notochord is present in the larva only, or is not developed. [ASCIDIA.] 3. Craniata, containing the true Vertebrates (q.v.).

Chorea (Gk. *choreia*, a dance), or St. Vitus' Dance, is a remarkable disease, occurring for the most part in children, the most prominent feature of which is the presence of irregular disorderly muscular movements.

Causation. The disease mainly affects children between 5 and 15 years of age; it is more common in females than in males. It often develops in rheumatic subjects, and like acute rheumatism it is frequently associated with disease of the valves of the heart. The onset of the disease is very often attributed to sudden fright. Chorea is sometimes met with in association with pregnancy.

Symptoms. There is commonly an initial period in which the child is out of sorts, dull, and listless, and then it is noticed that there is an inability on the part of the patient to exercise the natural control over muscular actions. Irregular convulsive movements are observable in different parts of the body. The shoulder is hitched up; the fore-arm and hand seem irresistibly impelled to execute curious purposeless movements; the lower extremities are also involved; the facial muscles by their contraction lead to the production of unexpected and inappropriate grimaces; the head is thrown from side to side; the tongue suddenly jerked out, perhaps bitten by the teeth. All these tumultuous movements are exaggerated by the attempt to use the muscles in a legitimate way, and thus, when the patient tries to hold objects in the hand, to walk, or to speak, the disordered movements interfere in a pronounced manner with the appropriate actions, and hinder or even render impossible the movements which he intends to carry out. These convulsive disorders, though by far the most striking, are by no means the only symptoms of the disease. There is nearly always some degree of paralysis of the affected muscles; loss of sensation, too, may occur; and there is often actual loss of intelligence. Palpitation is not uncommon, and auscultation of the heart not infrequently reveals the presence of valvular disease. In severe attacks of chorea the distress of the patient is very great, he is continually "on the move," he can only be fed with difficulty, sleep is seriously interfered with, bruises and injuries of various kinds may be sustained, and bed sores are apt to prove a formidable complication. In the majority of instances the disease assumes a mild form, and, unless aggravated by inappropriate treatment, tends to subside in four or six weeks; unfortunately, however, it is apt to recur.

Treatment. Attention to ordinary hygienic precautions and the administration of tonics seem to produce as satisfactory results in mild cases as any of the supposed specifics. According to many authorities, however, the administration of small doses of the liquor arsenicalis hastens the restoration to health. In chorea with rheumatic complications anti-rheumatic medicines are indicated. In the worst forms of the disease chloral and opium are of service. The patient's strength must be sustained, and stimulants may have to be given; the wet pack has been employed to restrain extreme violence of movement. Good nursing is of the utmost importance.

Chorion (Gk. *chorion*, skin), one of the fœtal membranes which plays an important part in development. The true chorion is described as including the vitelline membrane, the outer layer of the amnion, and the allantois. Its external surface is covered with processes, the chorionic villi, in which are formed loops of capillary blood-vessels. These capillaries undergo special development at the placental site, and, together with outgrowths from the maternal tissue, they gradually build up the highly vascular organ which forms the connecting link between the circulatory systems of mother and fœtus. [PLACENTA.]

Chorley, a market town of North Lancashire, about 8 miles S.E. of Preston, on the river Yarrow, with a station on the Lancashire and Yorkshire and North-Western Railways. The parish church of St. Lawrence is Norman, and contains a few

monuments. There is a free grammar school, a town hall, and other public buildings. Situated in the midst of a coal-field Chorley has many factories for the production of calicoes, muslins, chemicals, and machinery. Railway waggons are also built there on a large scale, and the district yields iron, flag-stones, and mill-stones.

Chorley, HENRY FOTHERGILL, was born at Blackley Hurst, Lancashire, in 1808. After a desultory education he gave up the idea of making music his profession, and coming to London took to journalism, and found employment on the *Athenæum*. Here his musical knowledge served him in good stead, and he acquired a high reputation as a critic, much of his ephemeral work being summed up in two entertaining books, *Modern German Music*, and *Thirty Years' Musical Recollections*. He was an appreciative supporter of Hullah, Gounod, and Sullivan, but failed to see any merit in Schumann, Berlioz, or Wagner. A personal friend of Mendelssohn, he wrote a preface to his *Letters*. Numberless *libretti* came from his pen, among them Wallace's *Amber Witch*, Benedict's *St. Cecilia*, Sullivan's *Kenilworth*, and Bennett's *May Queen*. He was the author, too, of many songs, and of a few forgotten novels and plays. He died in 1872.

Choroid, the coat of the eyeball lying between the sclerotic externally and the retina within, and terminating in front in the ciliary processes. [EYE.] The choroid coat is highly vascular and deeply pigmented. It is sometimes affected by inflammation (choroiditis). The existence of such a condition is readily detected by ophthalmoscopic examination.

Chorotegans, a Central American people of Nicaragua, south-east of Fonseca Bay, forming a separate group with the Dirians and Nagrandans of Leon, the Orotiñans of Guanacaste, and the Cholutecas of Honduras. They have been affiliated both to the Chiapanecs of East Mexico and to the Mayas of Yucatan, expelled from Cholula in pre-Aztec times. The Chorotegans had attained a considerable degree of culture under Aztec influences, nearly all traces of which were destroyed by the Spanish conquerors. In 1524 the missionaries of Managua made a huge bonfire of all their religious and historical paintings, calendars, maps, and other documents, while their temples were razed to the ground, their idols overthrown, and their graves desecrated. But numerous remains still exist in the islands of Lake Nicaragua, where Squier saw over fifty colossal basalt monoliths of human figures somewhat like those of Easter Island, Polynesia.

Chorus (from the Greek *choros*) signified originally a band of singers and dancers, who took a conspicuous part in solemn functions, especially in the worship of Apollo and Bacchus, where recitations alternated by chanted choruses were employed. From these religious services tragedy and comedy took their rise, the chorus in them being formed of boys or men. Sometimes the chorus represented women, but their parts were always played by men. For example, in the *Hecuba* of Euripides the chorus is composed of captive Trojan women, while in the tragedy of *Œdipus Rex* of Sophocles it consists of the elders of the city. The chorus of Greek tragedy varied in numbers from the 50 or so of Æschylus to the 15 of Sophocles. The leader of the chorus was called *Coryphæus*, a name surviving in our modern ballet, and the general management was in the hands of the *Choragus*, whose post conferred much honour upon its holder, and also entailed upon him great expenses in producing the entertainment and in supporting and providing for the performers. The arrangement of the chorus was occasionally antiphonal. In the revival of the performance of Greek tragedy, of late introduced at our Universities, the Greek practices have been followed so far as possible. The chorus was generally accompanied by flutes, and the music was of a rude and simple nature. In the modern chorus, a large body of voice is generally employed to alternate with solo, duet, etc. Plain song in unison, as practised in many churches, may be looked on as a form of chorus-singing. Bach's *Passion Music*, Handel's *Israel in Egypt*, Mendelssohn's *Elijah* give well-known examples of modern chorus. On the first revival of opera the chorus was intended to resemble in character the Greek chorus, and took little if any part in the action, but this feature gradually changed, and the chorus singing was entrusted to those taking part in the piece, as, for instance, the fishermen in *Masaniello*. Choral singing is much practised in parts of Great Britain, the Welsh and Yorkshire choirs being renowned, while very many have heard the gigantic chorus of the Crystal Palace Handel Festival.

Chose in Action is a right to recover which exists in law as against the actual enjoyment or possession of the thing. Thus money due on a bond is a chose in action, for there is a right to claim the money when payable, but there is no possession of it until it is recovered by course of law, or until payment be first voluntarily made. And so if a man promise or covenant with me to do any act and fail in it whereby I suffer damage, the recompense for this damage is a *chose in action*, for though a right to some recompense vests in me at the time of the damage done, yet what and how large such recompense shall be can only be ascertained by law, and possession can only be given me by legal judgment and execution. A chose in action, then, is a thing rather in *potentiâ* than *in esse*, and the owner may have as absolutely a property in, and be as well entitled to, things *in action* as to things in possession. By the Judicature Act, 1873, any absolute assignment in writing by the assignor of any debt or chose in action on notice given to the debtor or obligor passes the legal right to the same subject to all existing equities therein, as well as all remedies for recovery thereof, to the assignee. Formerly the assignee could not sue in his own name.

Chosroes I., or KHOSRU the Great, succeeded Cabades as King of Persia in 531 A.D. At first he maintained peaceful relations with the Roman

Empire, but subsequently attacked Syria, Mesopotamia, and Cappadocia, and was for a time kept at bay by the famous Belisarius, but after ten years' war he compelled Justinian to cede to him in 562 considerable tracts of territory, to which he added the results of further conquests in the East. Justin II. having refused to continue the subsidy paid by his predecessor, he again made an irruption into Roman dominions, and had just driven Tiberius III. to come to terms, when he died in 579. He was beloved by his Mussulman subjects as a just and generous ruler, but he proved an implacable foe to the Christians. He encouraged literature, and caused the well-known work *Kalilah and Dimnah* to be translated into Persian.

Chosroes II. succeeded to the Persian throne in 591 A.D. on the deposition of his father Hormidas, of whose murder he was suspected. Expelled by his subjects on account of his cruelty he sought the aid of Mauricius, the Roman Emperor at Byzantium, and by his aid was restored. When Phocas dethroned and killed Mauricius, Chosroes, under the pretext of avenging his death, marched, in 604, with a large force into Asia Minor, and extended his conquests as far as Carthage. In 622 he was defeated and forced back into his own dominions by Heraclius. Five years later he was deposed and put to death by his son Sirves.

Chota Nagpore [CHUTIA NAGPUR, LITTLE NAGPORE], a division or commissionership in the S.W. of Bengal, comprising the four districts of Hazaribagh, Lohardaga, Singbhum, and Maubhum, the seven tributary states of Chang Bukhar, Korea, Sirguja, Udaipur, Jashpur, Gangpur, and Bonai, and the two semi-independent states of Kharsawan and Saraikala. The total area is 43,020 square miles, and the population is mainly Hindu. In the Feudatory States there are many representatives of the primitive Kolarian race and of the early Gond settlers. The territory under British rule consists mainly of a great plateau 3,000 feet above sea-level, and drained by the Sabaurika and its tributaries. The outlying districts are mountainous and covered with forests yielding valuable timber, and swarming with wild animals. The soil is fertile, producing wheat, barley, pulse, cotton, and sugar. Coal and iron exist, but have not been worked much owing to defective communications.

Chouans (from an old French word *chouhan*, now represented by the Fr. *chat-huant*, a screech-owl, and cognate with our English *chough*) is said to have been given to the body of insurgent royalists in Brittany in consequence of the word being the nickname of their first leader, a smuggler named Cottereau, who died 1794. The movement began in 1792, and the early Chouans carried on against the Republican authorities a guerilla warfare marked by much cruelty. Under Georges Cadoudal (q.v.) and Charette they numbered 10,000 men. The movement was crushed by General Hoche, and a revival of it was again put down in 1799. The name was revived again for a time by a rising in 1814–15 in the neighbourhood of the Loire, and yet again in 1830 by the Duchess of Berri, the movement in this latter case being suppressed by M. Thiers.

Chough (*Pyrrhocorax graculus*), a somewhat rare British bird of the Crow family, now confined to the high cliffs of the south-western counties, though it formerly ranged inland, and eastward to Kent, (*Lear* iv. 6). The male is about seventeen inches long, and has jet-black plumage, glossed with steel-blue; the beak, legs, and toes are coral-red. The female is smaller, and the hue of her plumage is not so decided. These birds feed on insects, crustaceans, and berries, sometimes on grain, and, it is said, on carrion. The nest, containing four or five eggs, yellowish, marked with light-brown, is generally made in a hole in lofty rocks or in some ruin. The epithet "russet-pated" (*Midsummer Night's Dream*, iii. 2) is probably a misreading for "russet-patted" (= red-footed), which is adopted in the Clarendon Press edition of the play. *P. alpinus* is the Alpine Chough.

Chretien, or CHRESTIENS DE TROYES, a poet and romance-writer of the 12th century, of whose life little is known, but as several of his works were dedicated to Philip of Alsace, Count of Flanders, killed at the siege of St. Jean d'Acre (1190), it is conjectured that he lived under the patronage of that prince. His death is assigned to 1196. As specimens of early French language and style, and as supplying links in the Arthurian legend, his remains are of high interest. They display, moreover, considerable ingenuity, and a pure yet vivid imagination. The six romances that may be confidently pronounced to be his are:—1. *Erec et Énide*, from which Tennyson has borrowed; 2. *Cligés or Cliget;* 3. *Le Chevalier au Lion;* 4. *Guillaume d'Angleterre*, more modern in treatment; 5. *Le Chevalier de la Charette*, dealing with Lancelot du Lac; and 6. *Perceval le Gallois*, a very popular poem translated into all the languages of Europe. *Tristan et Yseult*, and *Le Chevalier de l'Épée* are lost, and the other poems attributed to him are unauthentic.

Chrisom, a flask used to contain the sacred oil or *chrism* with which a child was anointed at baptism, and also denoting the white linen cloth which was bound upon the child's head by the priest to keep the sacred oil for a time upon the brow. A *chrisom child* denoted one who died within a month of birth. Jeremy Taylor speaks of "phantasms that make a chrisom child to smile," and Dame Quickly tells us how "a parted like any chrisom child," when recounting Falstaff's death.

Christ. [JESUS CHRIST, MESSIAH.]

Christadelphians (brothers of Christ, or in Christ), an American sect which arose during the Civil war in America, and is said to have had its origin in the desire of some to avoid military service. The founder was Dr. John Thomas, of Brooklyn, from whom the sect is also called "Thomasites." It claims to reproduce the feelings of Apostolic times, and among its peculiar tenets are the absence of a personal devil, plenary inspiration of the Scriptures, the belief in the coming

physical reign of Christ upon the earth, and a conditional immortality, *i.e.* that for most death is a final unconsciousness, while others will rise again to be rewarded or to relapse into annihilation. The sect exists also in Great Britain, having its organ, *The Christadelphian*, at Birmingham. The doctrine is to be found in the *Elpis Israel*, and *Eureka* of Dr. Thomas, and in *Christendom Astray* of R. Roberts.

Christchurch. 1. A ancient municipal and parliamentary borough of Hampshire, situated at the confluence of the Avon and the Stour, 1½ mile from the sea, and 22 miles S.W. of Southampton. Until recently it was known as Christchurch Twineham, the latter word being a corruption of the Saxon Tweonaeteam. The Church of Augustinian priors, founded in the 12th century, is a noble specimen of Norman and Perpendicular architecture, and contains a fine rood screen of the 14th century, and a chapel built by Margaret, Countess of Salisbury, some 200 years later. A monument to Shelley stands in the west tower. There are also remains of a Norman castle attributed to the reign of Henry II. Clocks, watches, and hosiery are the chief manufactures, and salmon-fishing is carried on in the Avon. In Christchurch Bay there is a double tide every twelve hours. 2. The capital of the province of Canterbury, New Zealand, stands on both sides of the river Avon, 5 miles from the sea. It is surrounded by the level expanse of the Canterbury Plains, but the neighbouring district has been thickly planted with trees. The town is well laid out with broad, straight streets, and a good water supply is derived from artesian wells. It is connected with the port of Lyttelton by a railway 8 miles in length, and is the centre of the growing railway system of the province.

Christian, the surname of a distinguished British naval family, of whom the most noteworthy representative was Hugh Cloberry, who, born in 1747, commanded the *Suffolk*, 74, in Byron's action with d'Estaing in 1779, who was in the action with M. de Guichen in April and May, 1780, and who commanded the naval force at the reduction of St. Lucia in 1796. He died a rear-admiral and a K.B. in November 1798, at which time he was commander-in-chief at the Cape of Good Hope. His eldest son, Hugh Hanway, born in 1784, also rendered good service during the French wars, and died a rear-admiral in 1849.

Christian, or CHRISTIERN, the name of nine kings of Denmark, including the reigning sovereign. The more important of these are—

Christian II., who was born in 1481, came to the throne in 1513, and married Isabella, sister of the Emperor Charles V. He conquered Sweden in 1520, and by his cruelty to the leading inhabitants earned the sobriquet of "The Nero of the North." In 1522 Gustavus Vasa liberated his country, and thereupon the Danes deposed their monarch, who, after a vain attempt to recover his kingdom in 1531, was seized, and kept in prison until his death in 1559.

Christian IV., born in 1577, succeeded his father, Frederick II., in 1588, and married Anne Catherine of Brandenburg. He engaged in a war with Sweden, which terminated in a peace in 1613. His military abilities led to his being put in command of the army of the Protestant League in the war against Anstria (1625). Tilly defeated him at Lutter, and compelled him to accept humiliating terms. From 1641 to 1645 he was involved in another ineffectual struggle with Sweden. His admirable qualities made him very popular with his subjects, and several towns were named after him. He died in 1648.

Christian Connection, an American sect founded early in the present century, and existing in North Carolina, Vermont, Kentucky, and Tennessee. Although there is no creed, the sect is chiefly Baptist and Unitarian in views. It bases itself on the Bible, admits fellowship with all Christians, and makes personal piety the test of fitness for membership. It numbers about 120,000.

Christian Knowledge, SOCIETY FOR PROMOTING (commonly known by the initials S.P.C.K.), is a society founded in 1698, and dating its present name from 1701, for the purposes, 1st, of promoting and encouraging the building of churches and schools in England and Wales, and 2nd, for dispersing Bibles and tracts at home and abroad, and advancing the diffusion of Christian knowledge. It has now a wider scope. With a revenue of £40.000 a year it sends out missionaries, translates the Bible into different languages, edits grammars and dictionaries for the use of missionaries and others, and publishes works of many different kinds. There is a Scottish S.P.C.K. founded in 1709 for establishing schools in the lowlands and highlands of Scotland.

Christian Sound, a bay to the S. of Tierra del Fuego, 120 miles N.W. of Cape Horn. It was discovered in 1774.

Christiania, the capital of Norway, is a port situated at the extremity of the Christiania Fjord, at some 80 miles from the sea, in the province of Aggershuus. Behind it rises the wooded mountain of Egeberg. The modern town was founded by Christian IV. in 1624, on the site of the ancient capital, Oslo, now a mere suburb. The fortress of Akershus, the ramparts of which form a promenade, defends the harbour, where a brisk export trade is carried on in timber, pitch, hides, skins, oil-cake, salt fish, and iron, the imports being wheat, hardware, wines, and fancy goods. The chief public buildings are the royal palace, the legislative chambers or house of the Storthing, the university (1813), the cathedral (a cruciform edifice of brick), the museums, and the observatory. A curious institution is the large dining-hall or Dampköjkken. The botanical gardens are rich in Arctic flora. The streets are well built, and lighted with gas. There is railway communication with the chief inland towns, and with Sweden, and lines of steamers run to Lubeck, Hamburg, Amsterdam, London, Hull, etc. Among the principal manufactures are cotton fabrics, paper, soap, spirits, beer, and dressed timber.

Christianity is the name applied to that religion which professes allegiance to Christ as its

head. The origin of the name involves a question not altogether free from doubt. The word "Christianity" is not found in the Bible, and "Christian" only occurs three times (Acts xi. 26; xxvi. 28; 1 Peter iv. 16). It does not appear in the first of these passages whether the name was given in scorn by adversaries of the Church, or adopted by the believers themselves, but probability is in favour of the first view. The Antiochenes were noted for their habit of bestowing nicknames, and this was probably an instance of it. In the second passage there was contempt implied in Agrippa's words, and in the third St. Peter again implies that the world continued this contempt. Obviously the word meant persons who looked upon Jesus of Nazareth as the Christ, the Anointed One of God, whom prophets had foretold.

As the faith grew and was admitted as an existing fact, the name became its recognised name among believers. And the main features of the history of that first ingathering is recorded for us in the Acts of the Apostles. These features are, first, the conversions made among the Jews (Acts ii. vii), and in the neighbouring countries, and afterwards the great missionary work done among the heathens, mainly by St. Paul. And this brings us to the first great controversy which arose within the borders of Christianity, that between "the Circumcision and the Uncircumcision;" in other words, between those Jews who accepted Jesus as the Christ and the heathens who did the like. The Judaisers, as they were called, were those Jewish converts who were willing to recognise the heathen believers, but insisted that they must submit to the Jewish ordinances. This was the great controversy of St. Paul's life. The Epistle to the Galatians is throughout a passionate vindication of Gentile liberty against Jewish bondage, as he called the Judaising doctrine; there is much of it, too, in the Epistle to the Romans, and many references to it in his other writings.

Before the New Testament had closed a fresh subject of controversy had arisen, out of the relations of Christianity to the philosophies of the heathen world. The origin of matter and the origin of evil were subjects which had absorbed the attention of many a thinker in the ancient world, and have gone on doing so to this day. These were two questions which interlaced each other, and the answers which were given brought about the heresies which arose in the Church concerning the Incarnation of our Lord. "Matter is essentially evil," said one teacher, "therefore Christ cannot have had a material body. It was a seeming body, an appearance, not a flesh and blood reality." Those who taught thus were known as the Docetæ (Gk. *dokesis*, seeming). To this another class of speculators answered, "Jesus had a real body of flesh and blood, and it was sinful, because material; the Divine Christ came into union with this body, and remained until the crucifixion; then the material died altogether, and the divine part took its place." Against these errors, modified and multiplied to an extent which amazes us by their endless variation, the Apostle St. John, in the later years of his life, raised his voice. His Gospel is a vindication of the doctrine of the Incarnation of God, and his Epistles are indignant warnings that the denial of that doctrine is Antichrist.

All this time Christianity had been moulding itself into visible shape. The Sacraments of Baptism and the Lord's Supper, ordained by Christ Himself, were the distinguishing symbols of the Church from the very beginning, and the Acts give the plainest indications that there was a recognised ministry, though details concerning it are few. We have more in the pastoral Epistles of St. Paul to Timothy and Titus.

After the close of the New Testament the literature of Christianity became for a time scanty; the continuous stream being taken up about the beginning of the second century. The first Christian fathers, so far as they have come down to us, all wrote in Greek. The earliest Latin father was Tertullian. Between the close of the New Testament and his days came first what are known as the "Apostolic Fathers," Barnabas, Ignatius, Polycarp, Hermas, Clement of Rome. The writings of these fathers are of varying degrees of value, that value turning mainly upon two subjects—(1) the evidence furnished that the New Testament as now received was so received then, and (2) the light thrown upon ecclesiastical order and discipline. Thus, great stress is laid by Episcopalians on the fact that the three orders of ministry are recognised by Ignatius, but the opponents of this form of Christianity dispute the genuineness of his writings.

The persecutions to which the Church was subjected in the New Testament were mostly Jewish, the exception being where personal gain was involved, as at Ephesus and Philippi. But as the Church spread, heathenism became alarmed. For Christianity was not satisfied to hold its own opinions and let others hold theirs, it put forth a claim to universal obedience. Consequently the laws against "secret assemblies" and "non-licensed religions" were revived, and for the first three centuries persecution was carried on against Christianity, now fierce and active, now slumbering. The chief persecuting emperors were Nero, Marcus Aurelius, Decius, Diocletian. But nothing could hinder the progress of the Church, and the conversion of Constantine in the beginning of the fourth century was followed by the establishment of Christianity as the national faith of the Roman Empire.

There had been controversies and heresies all through the period of persecution, but they had been confined to particular localities. The establishment of the faith through the empire was almost immediately followed by the most serious doctrinal conflict which the Church ever went through. Arius, a priest of Alexandria, objected to some statements of his bishop, and committed himself to a doctrine, which denied the Godhead of Christ. Hot controversy followed, and made its way all over the empire. Constantine, following imperial instincts, summoned a great council at Nicæa in 325, at which Arius was condemned, mainly through the eloquence and clearness of statement of Athanasius, a young deacon of Alexandria. But though Arius

was condemned, his doctrine found enthusiastic supporters, and this among the imperial family; and the consequence was serious and lasting. Not only was the Church almost torn asunder with the controversy, but the Teutonic nations, who were now gathering on the northern frontiers of the empire, soon to break in upon it, conquer it, and break it up into fresh kingdoms, were converted from heathenism to Arianism, mainly by the energy of Ulfilas. a learned and self-devoted bishop of that faith. The Arianising of the Goths at once set them in fierce antagonism with the clergy, who remained true to the decisions of the Nicene Council, and who showed by their action that they preferred heathenism to Arian heresy. We have here the main cause of the falling to pieces of the first Gothic kingdoms which were set up in Italy, Gaul, and Spain. Thus it was the orthodox clergy who invited Clovis, the heathen Frank, to invade and overthrow the Visigothic kingdom of Gaul; he came, and soon after was baptised into the Catholic faith by St. Remy. Somewhat later a similar invitation was given as regarded Spain.

But we must go back a little. The Arian controversy was followed or accompanied by others springing out of it. Thus a second great council was held at Constantinople in 381, which asserted Christ's perfect manhood, both in body and soul, which Apollinaris. in his zeal against Arius, had denied. The third council, that of Ephesus, A.D. 431, declared that Christ, perfect God and perfect man, was yet One Person; and that of Chalcedon in 451, that in the One Person the two natures are distinct. These are the first four general councils.

The eastern provinces of the Roman Empire, though they had been entirely subdued to it, had never become fused in it as Gaul and Spain had been. In the latter countries the Latin language had largely entered into the common speech of the people, and Roman law prevailed. But in Greece the native language held its ground, and in the oriental countries the civilisation as well as language never became displaced. All this had its effect on Christianity. The Greeks held to their metaphysical subtleties whilst the Latins showed their attachment to sharp and clear definition. The Apostles' and Nicene Creeds were the product of Eastern Christianity, the Athanasian of Western. The difference of view was to end in a serious conflict. The Nicene Creed, which had received some additions at the Council of Constantinople, declared that the "Holy Ghost proceedeth from the Father." In the 7th century the Western Church added the words "and the Son" (*filioque*), and the addition was strenuously resisted by the Greeks. Here was the beginning of a divergence, which, followed by the denial on the part of the Greeks of certain claims of the Bishop of Rome. produced in the eleventh century the division between the East and West which remains to this day.

But before this disruption another terrible calamity had fallen on Christendom. Dissensions about the use of images and other subjects had much injured Christian feeling and unity in the East, when Mohammed suddenly appeared in the 7th century and declared that he was a prophet divinely commissioned to declare the Unity of God, and to enforce it by his authority upon the nations. At the head of fierce armies of followers he rushed over Arabia and the adjacent countries, and succeeded in establishing his faith within them. From that time until now Mohammedanism has been the religion of all the Asiatic countries which had been under the Roman rule, and it has also run along North Africa, and even established itself in Eastern Europe, in the ancient city of Constantine. No such bitter foe has Christianity had.

Other causes had co-operated to the injury which the Church was destined to suffer. The downfall of the Roman Empire was a necessity arising out of its luxury and corruption, and the establishment of the rule of a fresh race was bringing new life to that which was ready to die. But such revolutions mean terrible misery and bloodshed to those in whose time they are brought about, and so for many years Europe was desolated by horrible wars. Missionary effort was checked, though there are always sparks of light visible among the darkness. The names of Augustine, and Columba, and Boniface, all belong to these days.

The great changes which passed over the nations gave an impetus to one institution, not discernible at all in the first days, but which was now overshadowing Christendom. Whilst Rome was changing its rulers again and again, its bishop was held in respect by all in succession, as representing the faith which all held in common. The hierarchy of the Church held their own, when nothing did besides. So long as the emperors held undisputed rule, the bishops of Rome remained obscure; but when the imperial power came to nought, the people looked to the bishop as their Pope, or father; and Pope Leo the Great was the most important person in Italy. This was the origin of the Papal power. And as religion suffered under war and tumult, so also did learning. Literature, both religious and secular, all but died, and so we come to what are commonly known as the dark ages. They may be fixed as lasting from the 7th to the end of the 10th century. By that time the nations of the new Europe had roughly hewn out their fresh kingdoms, they were becoming consolidated, and there was a yearning after dynastic settlement. High above all, so far as Christianity was concerned, stood the Pope of Rome. Charles the Great of Germany had restored what was called "the Roman Empire," differentiating it from the old by calling it "the Holy," and visibly showing this by being crowned by the Pope at Rome. But his empire, though it preserved its title till the year 1806, was, in a very few years after his death, dismembered. Italy was lopped off it, and France became independent. Then the Roman Pope stood confessed as the representative of unchanging power. The great name connected with the claim of the Pope to be the representative of God on earth is that of Gregory VII. (Hildebrand), who was Pontiff from 1073 to 1085. From that time for many years the Popes were the arbiters of kingdoms. Innocent III. (1198–1216) put forth

more extravagant claims than Hildebrand. And the time of this ecclesiastical supremacy was marked by a revival, not indeed of literature in its modern secular sense, but of ecclesiastical learning and of speculation in theology and metaphysics. It was the age of the schoolmen and of monasticism. The latter institution, begun in the 4th century, was now spread over Europe, and the monasteries, though we admit the abuses and evils which were undoubtedly connected with them, had been mighty civilisers. To take only Great Britain, the beautiful ruins of Beaulieu, of Waverley, of Fountains and Tintern remain as memorials of the great Cistercian movement which led men to go into spots where was barrenness and swamp, and to cultivate and drain these, to breed cattle and sheep, to plant gardens and sow corn, and withal to work in the cloister with such assiduity, that, humanly speaking, we must admit that the knowledge and the copies of the Scriptures would have perished but for them.

With Innocent III. the Papal power culminated. Even higher pretensions than his were put forward by some of his successors, but they were not recognised. From his time the tide receded. The causes for this were manifold and complicated. The consolidation of the European kingdoms, the abandonment of the Crusades, the weakening of feudalism—all these things meant for a while the increase of monarchical power, and this in its turn meant enmity to the power of the Popes. The work so largely carried on by the monks, though at first it appeared to favour the ecclesiastical system, in the end undermined it by encouraging a system of inquiry into historical and scientific facts. In Great Britain no name stands higher as a pioneer of the study of natural laws than that of Roger Bacon. More deadly than both these causes was the shameless ambition, greed, and corruption of so many of the Popes. The fullest illustration of the first of these causes may be seen in the history of France. Philip IV. not only defied and humbled Pope Boniface VIII., but he was able to force the Popes to leave Rome and take up their residence at Avignon for 70 years, where they became altogether subservient to the French power. When at length they returned to Italy, the struggle which immediately arose between the French Cardinals and the Italians resulted in the great Papal schism, in which popes and anti-popes went on for years reviling and excommunicating each other. By the time this schism was healed the public opinion of Europe was largely alienated from the Papal system. The revival of learning in the end of the 15th century furnished another element in the upheaval which was now imminent, and under the preaching of Luther the storm burst. There had been preliminary signs of it, such as the preaching of Wiclif in England and of Huss in Bohemia. But when Luther publicly burnt the Pope's bull excommunicating him, thousands declared their adherence to him, and the great Reformation began, the assertion of the liberty of the human conscience and of the personal responsibility of each soul to God.

This great movement, therefore, marks one of the most important epochs in the history of Christianity, its separation into many separate communions, all nevertheless united in professing allegiance to Christ as their head. The points of divergence between them it would be an endless task to enumerate; but we may venture to assert that all who profess and call themselves Christians regard Christ as their leader and example. The Unitarians, though denying the Deity of Christ, are very emphatic in insisting on the Divine nature of His life, and in proclaiming Him as the supreme example. With the exception of this body, no professing Christians, probably, would hesitate to express their adherence to the Apostles' and Nicene Creeds, and these, therefore, may be taken as the general *symbola* of our common Christianity. The opponents of Christianity may be broadly divided into two classes, Agnostics (q.v.) and Materialists (q.v.). Of these the most numerous and probably the most formidable are the Agnostics.

The great division in the 16th century, resulting in the establishment of the Protestant communions, was followed by a reaction, mainly seen on the Continent, but not without important influence on England. This reaction was largely due to Ignatius Loyola, the founder of the Jesuits. That body, with other kindred bodies, made a new departure in the way of missionary enterprise, a work which had almost died out in the Middle Ages, but which not only the outburst of religious zeal, but the marvellous geographical discoveries of the 15th and 16th centuries, stimulated to a great degree. It was not until the 18th century that Protestant zeal made its grand and wonderfully successful effort, headed among Englishmen by Carey and Marshman, and taken up with a zeal begotten by admiration of their labours and thankfulness at their success. [MISSION.] That zeal still glows, and the missionary work of the 19th century is a prominent feature of the religious aspect of the time, and in spite of drawbacks the results are promising that the time is hastening on when the world itself will be converted to Christianity.

Christiansand, a fortified port of Norway on a fjord opening into the Skaggerack. It is surrounded on three sides by water, and possesses a fine harbour, protected by the fort of Frederichsholm. The Gothic cathedral is a handsome building; the streets are wide and regular, and the houses are mostly of wood. It is the seat of a provincial governor and a bishop, and serves as a naval station. Tanning, brewing, dyeing, and shipbuilding are the chief industries; and the exports include sea-fish, salmon and lobsters (fresh and tinned), timber, pitch, skins, copper, and iron. The British occupied the place in 1807.

Christianstad, a province (*laen*) and its capital in the S. of Sweden. The former has an area of 2,400 square miles, principally in the valley of the Helge. The soil, though swampy in parts, is fertile, and produces hemp, flax, timber, corn, and hops. The town stands on a sort of lagoon formed by the Helge about eight miles from the Baltic, the port Ahus being at the mouth of the river. It was founded by Christian IV. of Denmark in 1614,

and was the starting-point of the revolution that put Gustavus III. in power. It contains a fine church, the governor's house, a high school, an arsenal, etc., and produces woollen and leather goods, gloves, and tobacco.

Christiansund, a port in the court or circle of Romsdal, Norway, 85 miles S.W. of Trondhjem. It is built on three islets, between which the harbour is enclosed, and until 1742 was known as Lille-Fosen. The wooden houses, painted red, are dotted about the rugged rocks in quaint disorder. The place does a brisk trade in salt fish with Spain and Italy.

Christina, Queen of Sweden, the daughter of Gustavus Adolphus and Mary Eleanor of Brandenburg, was born in 1626, and came to the throne six years later, her father having fallen at Lützen. Her father had already begun to fit her for her position by giving her a masculine education, and this plan was adhered to by her aunt Catherine and the chancellor, Axel Oxenstiern. Though slightly deformed in one shoulder, exceedingly spare and wiry, and below middle stature, her face was, perhaps, attractive ; she excelled in manly exercises, often wearing male attire ; and she mastered an immense amount of general knowledge, besides Greek, Latin, and several modern languages. There can be little doubt, however, that her mind was warped by insanity. Still, on first assuming power in 1644 she displayed firmness, moderation, and wisdom. She brought the war with Denmark to an advantageous conclusion ; she terminated the Thirty Years' war by the peace of Westphalia ; she devoted much attention to commerce and education ; and she filled her court with learned men, such as Descartes, Grotius, Salmasius, and Vossius. Gradually, under the influence of foreign advisers, especially her French physician, Bourdelot, her conduct changed. She became recklessly extravagant, and refusing all offers of marriage, she indulged her passions and her vanity in the society of favourites, on whom were showered honours and rewards. She estranged herself from Lutheranism, and grew to dislike the homely simplicity of the North. In 1649 she formally named her cousin, Charles Gustavus, as her successor, and in 1654, when the discontent of her subjects showed itself in the revolt of Messenius, she definitely resigned the crown. In a man's dress, with a handsome income and considerable retinue, she now set out on her travels, and after passing through Denmark and Germany, and spending a year at Brussels, she went to Rome, and was received into the Church by the Pope. In 1656 she visited France and was well received, but returning next year met with a much colder welcome. On her condemning to death her favourite, Monaldeschi, and causing him to be privately executed in her own apartments, she was expelled from French territory. On the death of her cousin in 1660 she claimed the Swedish crown, but her subjects refused to listen to her. In 1666 she made another fruitless attempt to regain her position. The last twenty years of her life were spent in Rome, where she divided her energies between petty intrigues and the collection of works of art. At her death in 1689 many of her treasures were bought by Pope Alexander VII., Odescalchi, and the Duke of Orleans.

Christina Maria, Regent of Spain, was born in 1806, being the daughter of Francis I. of Naples. She married Ferdinand VII. of Spain in 1829, and on his death, four years later, became regent for her infant daughter Isabella. She soon found herself opposed by the Carlists, and Espartero, having defeated them, headed a movement against the sovereign, who had made herself disliked by her marriage with Fernando Munoz, an officer of the guards, and by her tyrannical conduct. After the rising of Narvaez in 1843 she returned to Madrid, and remained there till 1854, when O'Donnell and Espartero combined to put an end to her influence. She retired to France, and died at her villa near Havre in 1878.

Christison, Sir Robert, Bart., M.D., F.R.S., born in 1798, graduated at the University of Edinburgh in 1819, and from the outset of his career devoted himself especially to chemistry, materia medica, and the forensic aspects of his profession. After a course of study under Orfila in Paris, he returned to occupy the chair of medical jurisprudence at Edinburgh, exchanging it in 1832 for that of materia medica, which he held until 1877. His *Treatise on Poisons* was for a long time the received text-book in medical schools and courts of law. He gave important evidence on the trial of Palmer in 1856. He was twice President of the College of Physicians, Edinburgh, and was Physician in Ordinary to the Queen in Scotland. In 1871 her Majesty conferred on him a baronetcy, and he died in 1882.

Christmas, the festival commemorating the birth of Christ, seems to have first been of positive observance between 180–190 A.D. Diocletian is reported to have burnt in their church a number of Christians who had assembled to observe Christmas. It has in different times and places been observed at different times of the year ; but the actual birth could not have taken place in December, since the rainy season then prevails in Palestine. The feast seems always to have been in greater favour with northern than with southern nations, a fact which may be owing to the wisdom of the Church in fitting its own proper doctrines in with the prevailing worship of the old gods and the powers of nature. The old Yule has come down almost unchanged. The manger songs, dramas and carols which marked the period gradually died away, but the latter have been much revived of late, and in one spot at least the Boar's Head carol with its accompaniments has been handed down in an unbroken line. The old customs of giving presents and of feasting are still in some repute, though the time of the festival is much shortened—it having formerly lasted until Epiphany at least, and sometimes till Candlemas. The Christmas tree is said to have been adopted from the Saturnalia of Pagan Rome, and may have been introduced into Germany by Roman troops. Virgil is said to have alluded to it. The French Noel (*natalis*) is but the

faint shadow of our Christmas. Santa Claus, though associated with Christmas, has his real festival on December 6th. Though much of the Christmas festivities have died out in these gloomy and care-consumed days, the season is generally marked in England by family visits, the exchange of cards, the appearance of magazines, and the production of pantomimes. The Greek, English, and Lutheran Churches mark the day as separate, but in the Presbyterian Church it has little or no place. The Roman Church marks the day by the celebration of three masses, as readers of Alphonse Daudet will remember.

Christmas Box, a present made at Christmas, generally by an employer or superior to one employed. It is said to take its name from the practice in former times of would-be recipients to carry a box with a slit in the top, such as we may see in the streets on Hospital Saturday, or during a strike procession. The practice received a heavy blow in 1836, when it was forbidden in state departments by the authorities, but naturally it lingers on and is slow to die.

Christmas Cards, illuminated or otherwise painted or ornamented cards which are exchanged between friends as tokens of remembrance or goodwill. The practice, said to have been introduced in 1846, has of late been greatly increased, and now forms a considerable tax upon the exertions of the postal department, as well as bringing a considerable sum to the revenue.

Christmas Island lies in the N. Pacific (lat. 1° 41′ N., long. 157° 15′ W.). It is of coral formation, and has a circumference of about 60 miles, being covered in its western half by cocoa palms. Cook landed here in 1777 to observe an eclipse of the sun.

Christmas Rose (*Helleborus niger*), a herbaceous perennial ranunculaceous plant, a native of Central Europe, commonly grown in English gardens. It has a dark-coloured rhizome which is powerfully cathartic, but also violently narcotic and acrid. Its leaves are radical, pedately divided, dark-coloured and glossy. The flowers are produced in winter singly or two together on short peduncles with broad bracts, five large petaloid white or red sepals, minute green tubular nectaries representing the petals, indefinite stamens, and a ring of from three to five follicles. In texture it is less rose-like than is the Japanese anemone.

Christophe, Henri, king of Hayti, was of negro blood, and was born in Grenada in 1767. First as a slave and then as an emancipated servant he appears to have done his duty faithfully in a hotel at Cape Francois, St. Domingo, till Toussaint l'Ouverture's outbreak in 1790. Christophe, a man of colossal stature, and considerable force of character, gained the chief's confidence, and received the command of the north of the island. In 1802 he held Cape Town vigorously against Leclerc, but was forced to evacuate, joining Toussaint with the garrison. When the latter was seized and imprisoned, Christophe kept up the struggle under Dessaline, whom he succeeded after a period of confusion as king of part of the island. He was crowned in 1812 as Henri I., and set up a very respectable imitation of the French court, ruling with remarkable sagacity, encouraging education and the press, and drawing up a code of laws. In 1820, whilst he was ill, a republican revolt, headed by the "Duc de Marmalade," abolished the monarchy, and Christophe shot himself.

Christopher, Saint, a Christian martyr, who is said to have suffered in Syria or Palestine under Decius about 250 A.D. His day is kept on July 25. According to the legend he was a pagan of Herculean build, who desired to serve the strongest master in the world. First he served the devil, but abandoned him on finding he trembled before an image of Christ. One day a child asked him to carry him across a stream on his shoulders. He complied, but found himself completely overcome by the burden, and the child then revealed himself as Christ. Hence the name of the saint. He was throughout the Middle Ages regarded as the patron of labouring men, who frequently wore his badge.

Christopher, Duke of Wurtemberg, born in 1515, on reaching years of discretion adopted Lutheranism, and boldly asserted the claims of his father Ulric against the oppression of the Emperor Charles V. The battle of Laufen restored Ulric to his dominions, in which he was succeeded by Christopher, who abolished Catholicism in Wurtemberg, applying the revenues of the Church to educational purposes, especially to the theological university of Tübingen. He died in 1568.

Christ's Hospital, a large London school, at present situated in Newgate Street, on the site of a monastery of grey friars, and well-known to Londoners and the country at large, both by the quaint Tudor dress of its boys and from the advantages it bestows on many English boys. The yellow stockings, belt, bands, and long coat are still retained, but the cap has long since been discarded for the bare head, and the yellow petticoat was abolished in 1865; and possibly when the contemplated removal of the school into the country is brought about, the epoch may be marked by the adoption of a modern style of dress. The school takes boys from the age of 8 to 10, and retains them till 15 or 16, aiding them to start in life upon leaving. Boys who rise to the rank of Grecians remain longer, and are enabled to go with exhibitions to Oxford or Cambridge. At present the accommodation is for 1,100 boys and 90 girls, there being a tributary school in Hertford for 450 boys and 450 girls, of whom the boys are drafted to London as their age increases. The government is vested in the Lord Mayor, the Aldermen, and twelve Common Council men, and donors of £500. The institution possesses an income of £5,800, which will be greatly increased if its removal sets free for disposal the present site, and possesses some church patronage. The original building was burnt in the Great Fire. Its successor was designed by Sir C.

Wren. The present building, from the designs of Mr. Shaw, was erected in 1825. The Great Hall comes next to Westminster Hall for proportions. The education is classical, though provision is made for modern requirements. Many notable men have proceeded from Christ's Hospital, among them Coleridge and Lamb.

Chromates. These substances are the salts of the acid known as chromic acid, H_2CrO_4, or compounds of metallic oxides with chromic oxide, CrO_3. The *normal* chromates are analogous to the acid above as, K_2CrO_4, the salts known as *bichromates* or *dichromates* contain a double proportion of the chromic oxide, as $K_2Cr_2O_2$. They are an important series of bodies, many of considerable practical importance ; they are all coloured, varying in hue from yellow to dark red. Potassium bichromate (red, triclinic system) is largely manufactured from chrome iron ore, and is used for preparation of the other chromates, in dyeing, in photographic printing (carbon process), and for a variety of other purposes. Lead chromate, $PbCrO_4$, occurs native as crocoisite, and is artificially prepared for use as the pigment *chrome yellow*, a basic chromate Pb_2CrO_5 is known as *chrome red*, and a mixture of these two forms *chrome orange*. Other chromates are largely employed for scientific purposes in the chemical laboratory.

Chromatic Scale, in *Music*, signifies a scale of semitones, involving tones which do not belong to a diatonic scale.

Chromic Acid, H_2CrO_4, forms red crystals by cooling a solution of chromium trioxide, CrO_3. This latter substance is also frequently known by the name of the acid, and it is prepared by the action of sulphuric acid on potassium bichromate, and forms long scarlet deliquescent crystals. It is a very powerful oxidiser, and is much used as such in organic chemistry. A dilute solution is also used largely in microscopic work for the purpose of staining and hardening animal tissues.

Chromite, Chromic Iron, or Chrome Iron Obe, is an oxide of chromium, aluminium, iron and magnesium. It is hardly fusible alone, but with borax gives a chrome-green bead. It crystallises in regular octahedra, but is more commonly massive, sub-metallic, black, opaque, brittle, and sometimes magnetic. Hardness = 5·5. Specific gravity = 4·3 to 4·5. Chromite occurs chiefly in serpentinites and other rocks rich in magnesia, and is the principal source of the salts of chromium.

Chromium (Cr., atomic weight, 52·1), a metallic element, of which the chief natural compound is chrome iron ore, $FeOCr_2O_3$. It also occurs in chrome ochre, crocoisite and some other rare minerals. The colour of emerald and the green in serpentine are due to small quantities of this element. It is a very hard metal of a grey or greenish colour, with a specific gravity 6·8. It forms three oxides, CrO, Cr_2O_3. and CrO_3. Two series of chromium salts exist corresponding to the two first, but the highest oxide has an acid nature and yields the *chromates*. The chromic oxide, Cr_2O_3, is used in preparation of green glasses, enamels, etc., and as a pigment under the name of *emerald green*. Combined with water it is also known as *Guignet's green*. The salts of all yield solutions coloured green or violet, and many show a remarkable change from the one tint to the other by warming. A double salt of chromium and potassium sulphate is known as *chrome alum* ($K_2SO_4 + Cr_2(SO_4)_3 + 24OH_2$). This forms dark purple octahedra, largely used in calico-printing, dyeing, and tanning.

Chromosphere. [Sun.]

Chronicles, two books of the Bible which repeat in some degree the contents of the 2nd Book of Samuel and the Books of the Kings, though written from a different point of view, *i.e.* Levitical instead of Prophetical. They are considered to be of about 330 B.C., and the books of Ezra and Nehemiah are thought to be continuations of them. The Hebrew name for them is *Events of Days*, that of the Septuagint, *Paraleipomena* (things left out), and by Jerome they are called *Chronicon*.

Chronogram, a device by which certain letters in a name or inscription are made to represent a date, and are printed in different type from the remainder. The thing originated in later Roman days, and was revived at the Renaissance. An example is a motto adopted by Gustavus Adolphus, ChrIstVs DVX, ergo trIVMphVs, which gives the date 1632.

Chronograph (*time-recorder*), a contrivance used for the accurate measurement of periods of time. Thus in races Benson's chronograph is often employed ; an instrument by which the beginning of the period and its close may be instantaneously and automatically registered upon a dial. A favourite type is a paper-covered cylinder revolving regularly, upon which the given moments are measured by the interruption of an electric current. The chronograph has been employed to mark the transit of a star in two different places, telegraphic communication enabling the two to be instantaneously compared. The velocity of projectiles may be measured by a chronograph composed of screens placed at varying distances from the gun's mouth, the passage through each screen breaking an electric current and marking itself.

Chronology is the science of computing the lapse of time by observation of the periodical movements of the heavenly bodies. [Calendar.] The word is also applied to the arrangement of historically interesting events in the order of their sequence as taken from some one central event. [Era.] It is difficult to realise in the midst of modern civilisation, with its provision of clocks, calendars, and books of reference, that the idea of time is by no means simple. Time is to the individual a subjective idea, to be measured not by the beat of a clock, but by the intensity and variety of emotions. To the schoolboy the holidays pass more quickly than the school term, and every one knows how quickly time flies if a task has to be accomplished by a given moment. The idea of

time, then, like the cultivation of memory, is the growth of civilisation. Jacky, the savage, in *Never Too Late to Mend*, admires the white man's power of being able to look a long way backwards. Chronology may be described as the objective view of time. The ancient methods of computing time were vague. The Greeks computed their time by Olympiads, *i.e.* in groups of four years, each of which group was marked by the recurrence of the Olympic Games (q.v.). The Romans, again, dated by the consuls, and sometimes from the supposed year of the foundation of Rome. Their lives they would measure by *lustrums*, periods of five years. Christendom, for the most part, dates events backward and forward from the supposed moment of the birth of Christ, which is generally put at the fourth year of the 194th Olympiad. But here scientific and ordinary chronology present a discrepancy, since the one represents the year of Christ's birth by a cipher, and the other as the first year. The Greek Church counts time in a way differing from that of the West; the Mohammedans date from the flight of Mohammed; and the Jews have their own method of computation. The question of intercalated days, which are rendered necessary by the earth's motions not fitting in with the exactly rounded periods of years, comes more naturally under the head of CALENDAR. The French, during the revolution at the end of the last century, endeavoured to inaugurate a new system of chronology, but this never really took root.

Chronometer, any instrument for measuring time, but especially a watch-like instrument for measuring it with great regularity and exactness in order to facilitate the taking of astronomical and nautical observations. Accuracy is attained by exceeding delicacy of mechanical workmanship, and by various compensating devices which counteract the effect of the contraction or expansion of particular parts under the influences of heat and cold. This accuracy is not, however, absolute; and a ship at sea, therefore, commonly carries several chronometers, and her captain also takes care to ascertain before sailing the rate of losing or gaining of such chronometers as he takes with him. It is obvious that, if a chronometer, set to the meridian of Greenwich and going at mean time, be carried elsewhere, the observer may very easily discover, by comparing his Greenwich time with the observed time of his new position, in what longitude he happens at the moment to be. The invention of the chronometer is of somewhat ancient origin, but the modern chronometer dates from the time of the great improvements of Pierre Leroy, and of Arnold, Earnshaw, Barraud, Hatton, and other makers of the early part of the present century. [HOROLOGY.]

Chronoscope (*time-observer*), an invention of Sir Charles Wheatstone for determining the duration of luminous phenomena, *e.g.* a flash of light or the electric spark. Its main feature is a mirror which is in rapid motion. The speed of projectiles is sometimes measured by its means, and it has also been used to measure the time of passage of light through water and air respectively, in order to determine the proportionate degree of refraction.

Chrudim, a fortified town of Bohemia, 62 miles S.E. of Prague, on the river Chrudimka. It contains an ancient church, a convent, and a high school. Large horse-fairs are held here, and cloth is manufactured.

Chrysalis, an insect in its resting or pupal stage, that which intervenes between the caterpillar and the perfect insect. When the caterpillar is mature, it prepares for itself a kind of case, known as the cocoon; this is usually made by the spinnerets or spinning organs. After the last moult the insect enters into the resting stage during which the adult form is perfected. In some cases, however, as in the *Muscidæ* (including the housefly), the chrysalis retains the last larval skin. The appendages of the caterpillar are often modified into the corresponding parts of the adult, but in other insects this is not the case: thus in the housefly (*Musca domestica*) the head and thorax are not developed until the chrysalid stage. The life of the chrysalis is maintained by the consumption of the food stored up in the "fat body" of the caterpillars. The habit varies greatly with different species: in some cases they are hung up in very exposed positions on trees or shrubs, to which they are suspended by one end by a belt round the middle, or in other ways; or they may be hidden in clefts of trees or buried among roots.

Chrysanthemum, the name of a genus of *Compositæ* containing the common English ox-eye daisy (*C. leucanthemum*) and corn marigold (*C. segetum*). The name is, however, more commonly applied to the variable and beautiful species, long cultivated in China, and of late years immensely improved by selection in English gardens, which belongs strictly to the allied genus *Pyrethrum*, *P. sinense* being its technical name. The cultivated varieties vary considerably in the form of the leaf, which is generally somewhat mealy, and few, if any, of our garden flowers present an equal range of colour. In form, owing to the elongation of the tubular disk corollas ("quilled"), the asymmetric enlargement of those of the ray ("dragon") and other modifications, we get an almost equal variety; and this variability, coupled with the facts of their flowering

CHRYSANTHEMUM.

in November and December, and their hardiness, fully accounts for their growing popularity.

Chryselephantine (Gk. *gold and ivory*), a kind of statuary employed by the ancient Greeks, especially in the case of large statues. The method was to make the framework of the statue of clay or stone or other material, and to overlay it with accurately fitting plates of ivory to represent flesh and plates of gold to represent raiment. These plates could be detached, as, for instance, from statues only used occasionally in religious ceremonies. Famous examples of this statuary were the Olympian Zeus and Athene of the Acropolis, the work of Phidias. The Chryselephantine method was reserved for statues of the gods, and much offence was given by the Macedonian kings, who employed it for their own statues.

Chrysippus was born at Soli in Cilicia about 280 B.C. Having lost his patrimony he came to Athens, and studied philosophy under the Stoic teacher Cleanthes, and possibly under his master, Zeno. He acquired much learning, which, added to his natural acuteness and subtilty, caused him to be regarded as the main pillar of the porch. Of his voluminous but obscure writings we have only fragments. Like others of his school, he regarded ethics as the only science of importance, but he does not appear to have considerably advanced Stoical doctrine by introducing a class of indifferent things between the rigid limitation of good and evil adopted by his predecessors. He conceived the physical universe, including man, to be permeated by the universal soul or God, into which at death all individual souls are absorbed. Physical evil he repudiated, and moral evil he looked on as the necessary complement of good. He devoted much attention to formal logic, drawing up a scheme of the categories, and elaborating the hypothetical syllogism, to which he gave preference as the type of reasoning. He affected much the use of the Sorites or "heap of Chrysippus." His chief opponent was Carneades. He died in 206 B.C.

Chrysoberyl, an oxide of aluminium and beryllium (Al_2O_3BeO), occurring as a transparent green gem. It crystallises in the prismatic system, often in six-sided or stellate twins; has a vitreous lustre and a colourless streak, and is unaffected by acids, and with great difficulty fusible even with fluxes. Hardness = 8·5. Specific gravity = 3·6 to 3·8. A yellowish variety is known as *oriental chrysolite;* one with internal chatoyance is known as *cymophane;* and one green by sunlight and red by candle-light, as *alexandrite*.

Chrysolite, the transparent variety of olivine (q.v.), $(MgOFeO)_2SiO_2$, of a pale green or yellow colour with a vitreous lustre, colourless streak, and conchoidal fracture, crystallising in the prismatic system, and sometimes occurring in the Levant in masses of considerable size. It is often known as a gem by its French name *peridot*. Hardness = 6 to 7. Specific gravity = 3·3 to 3·5.

Chrysoloras, MANUEL, born at Constantinople about 1355, of high family, was early employed by John Palæologus to implore the aid of the Christian princes against the Turks. In 1395 he was invited by the Florentines to teach Greek in that city. He afterwards visited Pavia, Milan, and Venice, and then, on the invitation of Aretino, secretary to Pope Gregory XII., settled in Rome. He was sent by the pontiff in 1413 to arrange with the Emperor Sigismund the assembling of the council of Constance, and on his way to attend the first meeting in 1415 he died suddenly. His *Erotemata*, a Greek grammar, was long in use, but only one of his other works has been printed.

Chrysoprase, the apple-green variety of chalcedony (q.v.), owing its colour to nickel oxide.

Chrysostom, ST. JOHN (Gk. *Chrusostomos*, golden-mouthed), was born of an illustrious family at Antioch about 347 B.C. He was training for advocacy in the school of the sophist Libanius when the influence of his mother, Anthusa, led him to adopt a life of piety. After six years spent as a hermit in the wilderness his state of health compelled him to return to Antioch, where he was ordained (381), and speedily became so famous for his eloquence that on the death of Nectarius he was in 397 appointed Archbishop of Constantinople. His charity and piety won him the love of the populace, but a quarrel with Theophilus, Bishop of Alexandria, who was supported by the Empress Eudoxia, led to his banishment. To appease the people he had to be recalled, but his opposition to the erection of the Empress's statue almost within the precincts of St. Sophia again provoked his wrath. He was exiled to a convent at Cucasus on Mount Taurus, whence, as his influence still made itself powerfully felt in the capital, he was relegated to Pityus, near the Euxine, but died at Comana on the way (407). His remains were transported with great pomp to Constantinople by Theodosius, and are believed to have been carried thence to Rome. The Roman Church celebrates his feast on January 27, but November 13 is his day in the Greek calendar. His teaching tends to asceticism and now and then to mysticism, but breathes a spirit of broad charity. In his exposition of the Scriptures, to which he attached great weight, he is intelligent and practical. His homilies, liturgies, and other treatises are of value in themselves as illustrating the history of his times. Among the many editions of his works the finest is that brought out by Sir Henry Savile, Provost of Eton, in 1612 at a cost of £8,000, an enormous sum in those days.

Chrysotype, a photographic process, introduced by Herschel, and employed for the production of a "positive" print from a "negative." Paper is washed with a solution of ferric ammonium citrate, and dried. To obtain a print it is sufficiently exposed to light beneath a negative, and then "developed" by a solution of gold chloride and well washed. By the action of light the ferric salt is reduced to a ferrous, and this acts upon the gold chloride with formation of metallic gold which forms the image, which is of a blue colour. The action of ferrous salts may be represented by the equation

$$3FeCl_2 + HnCl_3 = 3FeCl_3 + Hn.$$

Chub (*Leuciscus cephalus*), a common English and European freshwater fish of the carp family. It is fairly abundant in the Thames, but rarely attains a weight of more than 5 lbs., and is little esteemed as a food-fish. The colour is brownish-green, paler on the sides, and white beneath; the tail and lower fins reddish. In America the name is given to the allied genus Ceratichthys, and to *Leuciosoma corporalis*.

Chubat, or CHUPAT, a Welsh colony of Patagonia, taking its name from the river that flows through it. The entrance to the river is 600 miles south of the river Plate, and admits vessels of from 7 to 12 feet draught. The Welsh-speaking settlers arrived in 1865, in 1867 they abandoned the colony, but subsequently returned, and in 1871 were shut off for twenty months from the outer world. The principal town is Trerawson, five miles from the sea. The products are English grains and roots and salt. A railway of 40 miles to New Bay has been projected. A president and council administer the colony.

Chubb, THOMAS (1679–1746), an English Deistical writer, born near Salisbury. Being left in poverty by the death of his father he was apprenticed to a glover, and then was employed by a tallow-chandler, and for many years his living was derived from these sources. His first work, *The Supremacy of the Father Asserted*, was published in 1715, and in 1730 many of his tracts were collected and published. Sir Joseph Jekyll, Master of the Rolls, took an interest in him and received him as a resident in his house for several years, though in what capacity is not clear. In later times he went back to Salisbury, where he pursued his favourite studies. His chief works are *A Discourse Concerning Reason* (1731), *The True Gospel of Jesus Christ* (1739), and two volumes of *Posthumous Works* (1748).

Chuck-Will's-Widow. [WHIP-POOR-WILL.]

Chudes, a Finnish people formerly widely diffused over the region lying south of Lake Onega, but now mostly extinct, or assimilated to the surrounding Russian populations. Two distinct Chudic languages still survive—the Wepsic, in the north, and the Wotic in the south. They form with Carelian, Tavastian, Livonian, and Esthonian the western division of the Finnish linguistic family. Russian writers often apply the term Chude to the whole of the Finnic group. Its origin is unknown, but some have supposed it to be the same word as *Scythian*, through an intermediate form *Skud*, whence *chud*.

Chukchi (TUSKI), a north-east Siberian people between the Anadyr river and the Frozen Ocean, and reaching from the Kolyma east to Behring Strait, probably of Koriak stock and speech; tall, lean, with coppery complexion, and very brachycephalic (round) skull, in this respect differing altogether from the Eskimo with whom they have sometimes been grouped. The Chukchi vocabulary of 1,000 words collected by Nordenskjöld shows that it is quite distinct from Eskimo. Two divisions: the Coast or fishing Chukchi, and the Reindeer Chukchi more inland. Chukchi is stated to be the Russian form of the national name *Chauktu*, meaning "men;" but Hooper gives the true form as *Tuski*, meaning "brothers" or "confederates" (*Ten Months among the Tents of the Tuski*).

Chunar, an ancient fortified town of India on the south bank of the Ganges, in the district of Mirzapur, in the North-West Provinces. The fort, on a summit commanding the river, contains the remains of a Hindu palace with some interesting carvings. Warren Hastings here made a treaty in 1781 with the Nabob of Oudh.

Chupra, a town in the province of Behar, Bengal, extending about a mile along the north bank of the Ganges. There is a large trade in cotton, saltpetre, and sugar.

Chuquisaca, more commonly known as Sucre, is the capital of Bolivia, and is on a tributary of the Pilcomayo, on a table-land 8,800 feet above sea-level. The climate is mild, and many of the miners of Potosi spend the winter here. The inhabitants are mostly a mixed race of Indians and Spaniards. The name is that of an ancient Peruvian town which occupied the same site. The present town, founded in 1539, was at first called Ciudad de la Plata. The name Sucre is derived from a general who fought in the last battle of independence in 1824. The town is the seat of an archbishopric, and has a fine cathedral, as well as a university and a hospital.

Church (Gk. *kuriakē*, from *kurios*, lord) means, etymologically, a body of people acknowledging one and the same head. Generally it is used to denote, according to the formulary of the English Church, "all those who profess and call themselves Christians." In a wider sense, the word includes not only those who are Christians, but also all the departed who have died Christians, and in this sense the Church is divided into the Church Triumphant and the Church Militant here on earth. But from an early period the name was applied in a much more restricted sense, since Scripture speaks of the seven churches. And so in modern times the name has come to be applied to an endless number of sects, more particularly to such as hold with episcopal authority, though the term is by no means restricted to such. The articles of the Church of England use the word in this sense, when they say "Churches may err and have erred." The expression "the Jewish Church" shows that Christianity is not essential to a church. Sometimes the word is used to distinguish the clergy from the laity, and a man who receives orders is said to enter the Church, and formerly a "Churchman" was a priest or monk, as, in the ballad of King Canute, "Row near the shore, knights," said the king, "and let us hear these churchmen sing." As popularly applied to a building for public worship, the word is so loosely used that it would be difficult to say what is or is not a church. [CHAPEL.]

Church, RICHARD WILLIAM (1815–1890), an English clergyman and noted man of letters. After spending much of his youth on the Continent

he entered at Oxford and was elected fellow of Oriel College. In 1853 he was presented to the rectory of Whatley, and in 1854 his *Essays and Reviews* established his reputation as a gifted and scholarly writer. He produced many works, some of the most esteemed among them being a *Life of St. Anselm* (1871), an essay upon *Dante*, *Spenser*, and *Bacon* in the "English Men of Letters" series, and many occasional essays. From 1871 till his death he was Dean of St. Paul's.

Church, STATES OF THE, were certain states of central Italy, ranging from Ancona and Ravenna on the Adriatic coast, and extending to the Mediterranean, having Rome as their capital, which formerly were in the temporal jurisdiction of the Pope. Taking their rise in a gift of lands made to the Pope by Pepin le Bref in the 8th century, these states have differed in extent from time to time. Shorn of much of their proportions in 1860, they finally ceased to exist, except as regards the Vatican and its surroundings, in 1870.

Church Discipline. In the ancient Church, which was a voluntary society, the sanctions were moral, as they are again in modern times, and depended for their efficacy upon the conscience of the individual Christian. Excommunication—which was a kind of religious boycotting—meant nothing to the man who was content to forego Christian society. But when the State adopted the Church and gave force to its decrees, Church discipline came to have a real meaning For instance, the Inquisition was a real and formidable power to those who questioned the Church doctrines, and many a proud monarch was brought to listen to the voice of the Church when his kingdom was placed under an interdict, *i.e.* a sentence of general excommunication. Till comparatively recent times men were put to open penance for breaches of Church discipline, and though in the Church of England discipline is almost in abeyance so far as the laity are concerned, excommunication is looked upon as a possibility, since a rubric forbids the use of the Burial Service over such as die excommunicate. The Scottish Church still retains a certain amount of discipline over its lay members. But in the English Church it may generally be said that discipline only exists for the clergy, and even for them its limits are very undefined. Except in the case of gross breaches, it depends for its efficacy in a great measure upon the offender's regard for the obligation of his oath of canonical obedience. In some respects the law of the land still enforces the decrees of an ecclesiastical court, but the procedure of these courts, and the curious manner in which their jurisdiction could be applied, made their almost entire abolition a necessary and welcome measure.

Church History. The history of the Christian Church is divided into three principal epochs. The first, the *Ancient*, begins with the foundation of the Church on the Day of Pentecost (Acts ii.), and lasts till the establishment of the Carolingian dynasty. From that date to the Reformation in the 16th century is the *Mediæval* period; and then succeeds the *Modern*. The historians who record the history of these periods are, first, those who were eye-witnesses of the events they record, or who lived within comparatively short distance of them; and, secondly, those who have compiled their narratives from records and memorials of the past.

I. THE ANCIENT EPOCH. The earliest book of Church history is the Acts of the Apostles, written, according to the universal tradition of early times, by St. Luke. This book does not contain the history of the work of the twelve Apostles, but confines itself to two main subjects—the foundation of the Church at Jerusalem and its organisation there, and the first beginnings of the evangelisation of the Gentile world, begun with the conversion of Cornelius and the extension of the Church to Samaria and Antioch, but carried on with marvellous success by St. Paul and his companions. From the close of the Acts till the next book of Church history there is a large gap, though the materials for the compilation are many. The Christian writings of the age immediately following the Apostles are mostly of a practical and hortative character, and these throw continual side lights on Church history. A few words should be said about these writings. We have first the *Apostolical Fathers*, *Epistles of Ignatius*, *Polycarp*, *and Clement of Rome*, *The Visions of Hermas*, *and the Epistle of Barnabas*, the genuineness of which, as a writing of the companion of St. Paul, is very doubtful. The chief value of these writings is the evidence which they furnish of the acceptance by the Church at the beginning of the second century of the New Testament writings. A little later there arose an "Apocryphal Literature," a collection of spurious Gospels and Epistles, written to propagate the Gnostic and other heresies. The Apologetic works of Justin Martyr and others were addressed to the unbelieving world in defence of the Faith which had now diffused itself so largely through the world, and was beginning to excite suspicion, fear, and hatred. Many of the Apologies have been quite lost, and of some only a few fragments remain.

The bitterest persecutions by the Imperial power of Rome began in the second century, and continued with intervals of repose till the year 311, when the conversion of Constantine was followed by the establishment of Christianity as the religion of the Empire. The two fiercest persecutions were those of Decius and Diocletian. Of the ten usually enumerated, several were only local. Simultaneously with these, a new philosophy—Neo-Platonism, the expiring effort of Gentile wisdom—attempted the construction of an eclectic system intended to supersede the Christian faith, and to re-interpret, in a theological and philosophical sense, the myths and traditions of Paganism. It was encountered by the formation of the magnificent Christian literature and theology of Alexandria. The greatest father of this school was Origen, a brilliant Biblical critic and scholar. The second great name is that of Clement of Alexandria. The West soon followed, though Latin Christian literature began, not at Rome, but at Carthage with Tertullian. Clear differences of view are manifest from the beginning between East and West. In the Alexandrian divines there is great boldness of speculation and love of

abstract ideas; in the West such men as Irenæus, Tertullian, Cyprian represent a pure supernaturalism in the form of tradition, embodied in symbolism and *regulæ fidei*, in opposition to all speculation; all that differs is rejected as heresy: "*adversus regulam nihil scire est omnia scire.*" From the days of Cyprian the magnificent stream of Christian literature flows on unbroken even until now.

The struggle of the Christian faith against the world, not for existence but for mastery, had won a decisive victory when Constantine gave his adherence to it. There "remained very much land to be possessed," but the sins of heathenism made their way into the fold. But from that time until our own it has been manifest that civilisation has entered into alliance with Christianity and has become its servant. As soon as Christianity became recognised and its victory became manifest, the line of Ecclesiastical historians began. There is but one previous to the epoch we have named, Hegesippus, and of his history only a few fragments remain. The father of Church History is Eusebius Pamphilus, Bishop of Cæsarea. He wrote a *History of the Church* to the year 324, and a *Life of Constantine*. His work was continued by Theodoret to A.D. 428. To these historians of the first period must be added Socrates Scholasticus, a candid and judicious author, and Sozomen, of less weight, florid and monastic. All these were Greek writers. Their Latin contemporaries, though they had (as their heathen brethren had done) begun by imitating the Greek, were assuming a more independent character. They were not historians, but their value to the modern historical student is inestimably great. The three principal Latin writers of this period were Hilary of Poictiers, Ambrose, and Augustine of Hippo, greatest of all the Latin fathers.

The age of Councils followed. The decrees of these Councils, and the collections of Canon Law, formed in the spirit of the Emperor Justinian's codification of the laws of the Empire, must be classed among the historical writings of the Church. Evagrius continued in Greek the histories of Socrates and Sozomen till the year 594. And now a fresh start began to be made in the history of national Churches. It marks the beginning of the modern nationalities, and the progress of the Church among the Teutonic nations. Gregory, Archbishop of Tours, who died in 595, wrote in Latin an *Ecclesiastical History of the Franks*, and the writings of our own Alfred, *The Anglo-Saxon Chronicle* and *The Ecclesiastical History* of the Venerable Bede, are all priceless historical records. Bede, who died in 735, is styled "the Father of English Church History."

Meanwhile the rapid rise of monasticism involved the end of the old classical style, and for years to come literature was a monopoly of the religious communities. And this synchronises accurately enough with the close of what has been called the Ancient Period of Church History.

II. Mediæval Epoch. Theological culture had almost died in the East. In the West the end of the Greek exarchate in Italy (752); the destruction of the kingdom of the Lombards (774); the formation of the powerful Frank empire under Pepin, and his successors; the alliance between this empire and the Papacy, involving the final rupture between Rome and Constantinople; the rise of the German Church, subdued by Charlemagne, and organised in subjection to Rome, all mark a great turning-point in the history of the Church. England, following the Continental lead, became a united monarchy under Egbert (827). Charlemagne's ambitious attempt to form a united Western Empire was shattered by the incapacity of his descendants, but it made the Christian Church the paramount influence in the centre and west of Europe. Charles had claimed and exercised imperial rights in the Church, even in respect to the election of the Pope. But the feuds which accompanied the dissolution of his empire vastly increased the Papal power. Bishops and abbots resorted to Rome when oppressed by their monarchs. These claims were further extended and legalised by the forged decretals which about the middle of the ninth century were received as authoritative by a credulous age unused to historical criticism. The resistance of the Roman claims ended in the separation of the Greek and Latin Churches.

The theological culture of this period was learned rather than profitable. The Eucharistic and the Predestinarian were the most prominent controversies. But in the East we have the beginning of a series of valuable Byzantine chronicles, Nicephorus to 770; Genesius 813 to 867; Leo Diaconus to 975; Simeon Metaphrastes to 963; Theophanes, *Chronicon* to 813. Of German annalists we have Regino to 907, Flodoard to 948, Eginhard to 850. In England Alcuin was one of the great lights of the West. He was invited to France by Charlemagne, and was greatly instrumental in the promotion of learning. He died 804. The establishment of schools is a marked feature of the period.

The *Sæculum Obscurum* came on, the period of transition from the Ancient to the Modern order. It was a period of war and strife. The schools were closed, the Papacy became involved in the bitter feuds of the times, and fell under the power of a Roman faction, who placed in the chair, which Leo and Gregory had filled, some of the vilest of men. Order was restored, and the Church reinvigorated by the renovation of the German Empire under Otto the Great (936). This gave Germany a centre of unity, reduced North Italy to subjection, and controlled the Papacy. From Otto to Henry IV. all the Popes were confirmed by the Emperor. But the growth of learning and the revival of discipline in the monasteries enabled the great monk Hildebrand to turn the balance, and in the fierce struggle between him as Pope Gregory VII. and Henry IV. he put forth his claims of Theocratic Monarchy, and for a while the Papacy was the strongest power on earth. The Pope was held to be *janitor regni cælorum*, and the false decretals were made supreme over the old Canon law. In 1054 the Eastern and Western Churches were formally sundered by mutual excommunication.

Learning revived in the West in the eleventh century in the form of Scholasticism, and in 1120 began a great revival of Greek literature under the

Comneni. In England we have valuable historians:—Eadmer, Abbot of St. Alban's (*Hist. Nororum*, 1066-1112); Ernulf, Bishop of Rochester (*Textus Roffensis*); Simeon of Durham, flor. 1130 (*Chronicles*, etc.); Geoffrey of Monmouth, d. 1138; William of Malmesbury (*De Regibus Anglorum*); Florence of Worcester, d. 1118; Henry of Huntingdon, c. 1150; William of Newbury, d. 1208; John of Salisbury (*Polychronicon*); Roger of Hoveden (*Hist.*, 731–1202); Caradoc, d. 1157 (*History of Wales*).

Under Innocent III. the Papal power reached its height. Then it began to decline, though the pretensions of Boniface VIII. were higher than those of any of his predecessors. The system had done a good work in drawing to the Gospel the rude tribes of Central and Northern Europe, in keeping the Church independent of the State, and in collecting and transmitting ancient learning. It was a schoolmaster of the nations, and when it had done its work their pupilage ceased. It diffused the culture which ultimately undermined itself. In doing its proper work it attempted much more, and when it found that spiritual weapons were unavailing, it resorted to craft and coercion. Nor was this all. Instead of the old Catholicity there were novel usurpations. Intolerable exactions drained the gold from the European States, simony became a system, the traffic in Indulgences became so shameless as to kindle the wrath of Europe. St. Bridget said, in her time, that at Rome the whole Decalogue was abridged into one precept, "give gold," but it was worse after her. The Papacy became a byword for shameless nepotism. And when, in addition, protests made against these evils were met by the Inquisition, it was evident that a searching and far-reaching reform was called for. In England the great name of Wiclif is identified with a movement in this direction.

This led to the great councils which are distinguishing landmarks of the fifteenth century. They failed to carry through any real reforms, the popes being too astute to suffer them, and a Protestantism began to course through the mind of universal Christendom. It was helped first by the invention of printing, which diffused among the people the culture which had been confined to the clergy and to kings' courts; and secondly, by the revived study of Greek and Roman literature, extended though not occasioned by the fall of Constantinople. This opened up the sources of Christian history, and drew back the veil which had long hidden primitive Christianity and the sacred Scriptures. The Papacy began to be suspected of lacking the historic base on which all its assumptions rested. Then, again, the old feudalism in nearly all the European states had given place to vigorous monarchies which consolidated the nations. This was a heavy blow to Papal pretensions.

The fifteenth century witnessed the decline of the scholastic learning, and the rapid growth of a reforming literature accompanied with the classical revival to which we have just referred. The names of Platina (died 1481) (*Lives of the Popes*), Froissart, Philip de Commines, Guicciardini, are noteworthy among historical writers. Wiclif and Huss were reforming writers, hostile to traditional beliefs; and Gerson, Chancellor of the University of Paris (died 1429), Savonarola (died 1498), were also earnest reformers on Church basis. The *Imitatio Christi* of Thomas à Kempis may also be classed among real works for reformation. The great Papal schism had terribly weakened the Church, but had been healed. Nevertheless, good men saw that nothing had been done to reform abuses. The fifth Lateran Council (1512 to 1518), convoked by Julius II., demonstrated the impossibility of reform without upheaval. It may be regarded as the last movement of the Mediæval period. When its sessions were opened Luther was twenty-nine years old, Zwingli twenty-eight, Calvin three. The preparations for the great change had been going on in all the spheres of life. But the parties as yet had no common principle or great leader. The authority of Mediævalism was broken, but the rallying note of the New Order was not yet sounded. Even at Rome there was no faith in the old system. Erasmus wrote, "At ego Romæ his auribus audivi quosdam abominandis blasphemiis debacchantes in Christum et in illius Apostolos."

III. Modern Epoch. Modern History begins with the Reformation of the sixteenth century. Its causes, as we have seen, run back two centuries, into the heart of the Middle Ages; its warrant was found, not merely in the needs of the European peoples, but also in the Scriptures and in the best traditions of the Christian Church. The moving cause was not opposition to the Papacy; it was a deeper spiritual experience, a sense of sin and of the need of deliverance. By the Reformation Christendom was divided into two main parts, the Roman Catholic and the Protestant. Southern Europe adhered to the former, North and North-West to the latter, the Centre being divided. It may be said that no Celtic race accepted the reform. So widespread was the sense of the need of reformation, that during the first forty years of the movement more was gained than was retained. A reaction, headed by the Jesuits, succeeded in bringing back France and South Germany to the Mediæval Church. But the Reformation was planted in the most free and advancing nations of Europe, and its greatest triumphs have been with these. But even Roman Catholics admit that the reform movement brought back life into their own Church, and caused it to put forth its energy with greater force and concentration. It must be noted that the discoveries of Columbus had added a new continent to the civilised world. Of this continent South and Central America became Roman Catholic and North Protestant, except Lower Canada and Louisiana.

The Reformed Churches on the Continent were divided into two main portions, the *Lutheran*, or "Reformed," and the *Calvinistic*, or "Evangelical." In England the ancient Episcopal constitution was preserved, but, so far as related to doctrine, the sympathies of the leading Reformers leaned towards Calvinism. At the commencement of the Reformation the three great powers were Charles V., Francis I., and Henry VIII., and the national struggle in Europe was respecting the supremacy

of France or Spain. Italy was the chief battle-field of that struggle. Monarchical absolutism was at its height. Then came the disastrous Thirty Years' war, in which was seen the strange fact that Cardinal Richelieu, in order to humble the pride of Germany, sided with the Protestants who were struggling against Imperialism. That war was ended by the peace of Westphalia in 1648, which established the political rights of the reformed churches and princes of Europe. All of the great Confessions of Faith had now been written. The Reformation was an accomplished fact, the struggles of the Church from that date were against the Deism of England, the Pantheism of Germany, and the Atheism of France.

The literature of the Reformation Period was immense in quantity, for in this respect printing introduced a revolution, bringing all the points of controversy before the public mind. In 1523 Luther published 183 works; other reformers, 123; the other side only twenty. Calvin was the father of the modern system of Biblical criticism. He was a far better scholar than Luther, had great organising power and logical acuteness. His works were published in 12 vols. folio at Geneva in 1556. In English they make 52 vols. The impetus given to the study of the Scriptures by the Reformation is shown by the manifold editions of them. The Complutensian Polyglot was published in 1520; Erasmus' New Testament (the first edition printed in Greek) in 1519; Luther's German translation, 1523 to 1532; the English version of Cranmer in 1538, and several versions followed it, ending with the present Authorised Version, 1611. Then, along with a splendid secular literature in the days of Elizabeth, the writings of Hooker were the beginning of a religious series equally glorious. Here are some of the great names of theologians of the seventeenth and eighteenth centuries: — Bishop Jewell, Geo. Herbert, Donne, Bishop Andrewes, Bishop Hall, Chillingworth, Archbishop Bramhall, Bishop Jeremy Taylor, Bishop Pearson, Barrow, Archbishop Leighton, Sherlock, Bishop Sanderson, Bishop Bull, Bishop Beveridge, Cudworth, John Bunyan, Baxter, Owen, Howe, Matt. Henry, Doddridge, Hickes, Leslie, John Johnson, Archbishop Potter, Lardner, Waterland, Bishop Butler, Bishop Warburton, Toplady.

Of Church historians we have to name in England—Thomas Fuller (*Church History of England*), Heylin (*History of Reformation*), Twysden (*Hist. Ang. et Scriptores*), Dugdale (*Monasticon*), Rymer (*Fœdera*), Selden (*On Councils*), Bishop Pearson (*Cyprian, Ignatius, etc.*), Cosin (*On the Canon*), Thorndike (*Church Government*), Stillingfleet (*Origines Sacr. Britan.*), Burnet (*History of His Own Time*), Cave (*Lives of Apostles and Fathers*), Bingham (*Origines Ecclesiasticæ*), Wall (*On Infant Baptism*), John Johnson (*Canons of Church of England*), Strype (*Annals*), Prideaux (*Con. of O. and N. Test.*), Wake (*Apostolic Fathers*), Gibson (*Synod. Angl. Codex Juris*), Wilkins (*Concilia*), Le Neve (*Fasti Eccl. Angl.*), Jortin (*Eccl. Hist.*), Burns (*Eccl. Law*), Milner (*Church History*). French Protestant Church historians of the same period are Suicer (*Thes. Eccl.*), Hottinger (*Hist. Eccl.*), Daillé (*De Usu Patrum*), Oudin (*De Script. Eccl.*), Benôit (*Edict of Nantes*), Lenfant (*Councils of Fifteenth Century*), Beausobre (*Manicheans*), Le Sueur (*Eccl. Hist.*). In Holland flourished Spanheim, Basnage, Le Clerc; and in Germany lived the illustrious Mosheim and Semler. Roman Catholic Church historians were Bossuet, D'Achery, Mabillon, Martianay, Martene, Montfaucon, the Benedictines of St. Maur, Harduin, Ruinart, Cotelerius, Baluze, Maimbourg, Le Cointe, the authors of the *Acta Sanctorum*, Du Pin. Launoi, a Sorbonnist (*Le Dénicheur des Saints*), though remaining in communion, vigorously attacked legends of the saints, the Immaculate Conception, and defended Gallican liberties. Fleury, who wrote an ecclesiastical history in twenty quarto volumes, was also a strong Gallican. Tillemont was the great Jansenist historian.

The English Revolution against Charles I., the establishment of a Commonwealth for twelve years, followed by a reaction in favour of monarchy and the Restoration of the Stuarts, had permanent effect upon the English nation. Though the people gladly restored the monarchy, much of Puritan teaching had entered into their souls, and remains with us still. Unhappily the Stuarts had not learned wisdom in exile, and the shameless immorality of Charles II. led to a terrible deterioration in the national character. And thus the 18th century opened with many discouraging features. France was given over to infidelity, Germany to rationalism, England to indifference. The Roman Catholic Church had lost its hold on the educated classes. Politics and philosophy were the great interests. It is sadly significant that the first great attempt in England to estimate the effect and influence of Christianity as a factor in the history of mankind was that of Gibbon in his *Decline and Fall of the Roman Empire*. He is the founder of the great school of English history, and his name as historian still remains the greatest, but he was an infidel. And the philosophical writings of his contemporaries are honeycombed with Rationalism and Arianism. The outcome, so far as France was concerned, was the terrible Revolution of 1789. The saviours of England from a similar catastrophe were Wesley and Whitefield, to whom were owing the revival of practical piety in England and the great evangelical movement which followed. The names of Wilberforce, Simeon, Bickersteth, Bradley, Melvill, are all illustrious in this connection. The reaction against the want of ecclesiastical doctrine and discipline in this party led to a counter-movement commonly known as the Anglo-Catholic or Tractarian, the latter name being derived from the *Tracts for the Times*, in which its principles were advocated (1833–1841). The leaders in this movement were John Henry Newman, Richard Hurrell Froude, Dr. E. B. Pusey, John Keble, Hugh James Rose. The first-named of these joined the Church of Rome in 1845, and after many years was made a Cardinal by Pope Leo XIII. The secession of Dr. Newman was for a few years a check to the Tractarian movement, but it revived under the care of Keble and Pusey. An attempt made to enforce its views on Baptismal Regeneration led to

the *Gorham Case* in 1847 *seq.*, and the attempt failed, in consequence of which several of the leading men in this party, Manning, Maskell, H. W. Wilberforce, and others, joined the Romish Church.

The publication of *Essays and Reviews*, a collection of writings, most of which were rationalistic, led to an attempt to expel two of the writers, but this also failed, and the comprehensiveness of the Church of England was secured. The principal parties within it are generally reckoned as High (the advanced wing of which is known as Ritualistic), Low (the old Evangelical), and Broad. The latter contains many grades. In its ranks have been reckoned Coleridge, Arnold, Jowett, Maurice, Hare, Kingsley, Macnaught. Some of them vigorously refused to be reckoned in this party, and certainly Jowett, Maurice, and Arnold held widely different views. They were all pious, learned, and earnest men, but while Arnold was largely in sympathy with the Low Churchmen, so was Maurice with the High, while Jowett has much affinity with the German Freethinkers.

The publication of the work entitled *Lux Mundi* marks the beginning of a new school, in which the free criticism of the letter of Scripture is united with a strong belief in the authority of the Church and Creeds.

One of the brightest features in the aspect of the religious movements since the Reformation has been that of missionary enterprise. At first the Roman Catholics took the lead, under the impulse of the newly-formed Order of Jesuits. The Orphan House of Halle undertook Lutheran missions in the East, and the Society for the Propagation of the Gospel, founded under King William III., led the missions of the Church of England. But at no period since the first century of the Christian era has the missionary growth of our holy faith been so auspicious as now. £2,000,000 are expended yearly in this work by Protestant societies. The Roman Catholic missions under the Propaganda spend about £200,000 a year.

Rationalism in Germany began in the 18th century, reason being made the ultimate arbiter of truth in contrast with revelation ("supernaturalism"). In criticism and theology Paulus and Strauss carried Rationalism to its extreme consequences. By his appeal to a specific Christian consciousness Schleiermacher broke the power of Rationalism as to doctrines, though in Biblical criticism he yielded to many of its conclusions; his influence has greatly shaped subsequent parties. The orthodox school of Lutheranism, represented by Olshausen, Neander, Dorner, Müller, has done great service by its depth of piety and its great learning.

In the Roman Catholic Church the doctrine of the Immaculate Conception was made an article of faith in 1854, and the personal infallibility of the Pope in 1870. A reaction against these dogmas resulted in the separation of a large number, the chief of whom was the great historian Döllinger, and these still form the communion known as the Old Catholics.

Among the writers on Church history of the nineteenth century may be mentioned Neander and Gieseler in Germany, Renan in France, Schaff in America, and Robertson, Lightfoot, Westcott, Hatch, and Farrar in England,

Church Music, a term used to denote anthems, hymns, psalms, voluntaries, and the like—in short, any kind of music which, by reason of its solemnity, is considered fit to be employed in public worship. Opinions as to what is or is not fit for church music differ, and have differed, in different ages, countries, and churches. What is approved of, for example, in some foreign churches, would give the greatest scandal if employed in a Scottish Presbyterian church.

Church Rates. These are tributes for the expenses attending the reparation and necessaries of the parish church. They are charged on all lands and houses in the parish, are assessed on the occupiers, and are made by the parishioners at large, that is, by the majority of the parishioners present at a vestry summoned for that purpose by the churchwardens. But they are not now, as a general rule, compulsory on the persons rated, and the only result of a refusal to pay them is a disqualification from interfering with the moneys arising from the rate. This important change in the law was effected by an Act passed in the thirty-second year of the present reign, which recites as a reason for the abolition of their compulsory levy that "church rates have for some years ceased to be made or collected in many parishes by reason of the opposition thereto, and in many other parishes where church rates have been made the levying thereof has given rise to litigation and ill-feeling." This Act, however, did not interfere with church rates established by special local acts. In Scotland the expenses of maintaining the churches is borne by owners of houses in proportion to their rental value.

Churchill, CHARLES (1731–1764), an English satirist, who, after being educated at Westminster, and entered at Trinity College, Cambridge, brought his university career to a full stop by a Fleet marriage. He then read for the Church, and was ordained priest in 1756, and on his father's death in 1758 was appointed to the curacy and lectureship of St. John's, Westminster, but three years afterwards, his conduct, startling even for those times, drew upon him the censure of the dean, whereupon he at once resigned his appointment and threw off the clerical character. His first published poem, *The Rosciad*, a satire upon actors, and his *Apology*, an attack upon the critics of the *Rosciad*, came out in this year. In 1762 he published *The Night*, in which he apologised for separating from his wife, and *The Ghost*, in which he ridiculed Johnson. In the *Prophecy of Famine* he ridiculed the Scots, and his *Epistle to Hogarth* is said to have moved the caricaturist deeply. In 1764 appeared *The Times*, the last of his works of any merit, and in the autumn of the same year he went to Boulogne, where he died of a fever a few days after his arrival.

Churchill, LORD RANDOLPH, born 1849, the third son of the seventh Duke of Marlborough, was educated at Eton and at Merton College, Oxford. He entered Parliament as member for

Woodstock in 1874, and in 1880 he made himself prominent in politics as the leader of what was called the Fourth Party. Though not always in harmony with the leaders of the Conservative party, he did the party no harm even if he did it no good, and began to be looked upon as a possible Conservative leader of the future. In 1885, after contesting Birmingham unsuccessfully against Mr. Bright, he was returned for South Paddington, and was Lord Salisbury's Secretary for India. In 1886 he became Chancellor of the Exchequer and led the House of Commons, until he resigned suddenly, in December of that year, upon the question of economy. Since that time he has dropped considerably out of politics, but has been lately brought into public notice by his expedition to Mashonaland. His wife, a New York lady, is said to be of great political help to him.

Churchill River rises in lat. 55° N. between the Saskatchewan and the Athabasca, and after a N.E. course of 1,000 miles under different names, through a series of lakes, enters Hudson's Bay, near Fort Churchill. Much canoe traffic takes place in the summer, and many portages are made necessary by the numerous rapids. The harbour is a likely terminus for the Lake Winnipeg railway on the direct Canadian sea-route to England.

Churching, a very old custom of some branches of the Christian Church, and said to take its rise in the Jewish custom of the purification of women. By this custom women after childbirth come to church and take part in a special service, which in the English Church consists chiefly in a thanksgiving for their safe deliverance. In some places the opinion still prevails that a woman who goes abroad after childbirth without having been churched has no remedy against insult. The Greek Church makes the ceremony a presentation of the newly-born child to the church. The word is used also to denote the attendance at church after some important event of life. For instance a bride used to be churched after the marriage ceremony, and newly-elected municipal bodies were sometimes churched.

Churchwardens are laymen who have charge of the temporal concerns of a parish church, except with regard to the chancel, which is in the jurisdiction of the incumbent. They are generally two in number, and are appointed by incumbent and people, or, often, to avoid dispute one is appointed by the incumbent and the other by the people. The churchwardens act conjointly, not singly, and are responsible to the bishop for the condition of the fabric and for the decent celebration, on the part of the congregation, of public worship. There is sometimes friction between the incumbent and the churchwardens, owing to the exact limitations of their respective rights and duties being somewhat undefined. The word churchwarden is also used to denote a long clay pipe, and it also has a local signification of cormorant.

Churchyard, the plot of land surrounding a church and generally associated with the idea of burial. The churchyard seems to have been earlier than the church, owing to the sacredness attached in Roman times to a burial-place, and it was by no means universal to bury the dead in the church or surrounding yard. This practice began to prevail in the 6th century, and has continued till sanitary reasons in the present day have dissociated the connection—in towns at least—of the church with the graveyard. But still to many people there is something painful in the idea of not resting after death near the church which they and perhaps their forefathers have attended. The churchyard forms part of the incumbent's freehold, but he can only deal with it as a life-tenant. He may feed his cattle or sheep in the churchyard, and may permit others to do so, but he can cut no timber except for the repair of the church. The question of fencing the churchyard and keeping the fences in repair differs in different places.

Churn, a word whose cognate forms appear in many languages, denotes the vessel in which cream or milk is agitated in order to separate the particles and induce the formation of butter. There are many varieties of churn, from the old-fashioned upright one, in which a vertical rod with dashers attached is worked in a vertical direction, to the ordinary barrel-shaped churn, which sometimes consists of a stationary cylinder in which dashers fixed upon a horizontal axis are turned by means of a handle, sometimes of a movable barrel which is itself made to revolve. There are also modifications of these principles. The word is also used metaphorically of the violent agitation of any substance. Thus, the paddle-wheel of a steamer is said to churn the waves to foam.

Chusan, the chief of the group of islands called the Chusan Archipelago, a mile off Ningpo on the E. coast of China. The island is 51 miles long, with an average breadth of 8 miles, and is 51 miles in circumference. It is picturesque, fertile, and well watered, and much rice is grown, as well as tea and cotton. Near the S. shore is the capital Tissghai, which is surrounded by a wall and ditch, except at one point where the spur of a hill projects into the town, and renders it easily accessible. It was occupied by the British from 1841 to 1846, and again in 1860. The silver wares and carved work of Chusan have some reputation.

Chuta, a people of Baluchistan. They claim Rajput descent through the Sumrah tribe, conquered by the Summaus in 1315, when they fled from India and joined the Brahuis, with whom they are now grouped. Chief divisions: Buteni, Notani, Sardikani, Turani, Bandejo and Shada.

Chutia, a people of Upper Assam, generally classed with the Kachâri family, but are more probably a branch of the Miri, having reached the Assam valley from the north-east. They were dominant in Upper Assam till overthrown in 1350 by the Ahom invaders from Burma. Since then all have become Hinduised in speech and customs, except the Deori Chutias of the Lakhimpur district, who still preserve the old tongue, if not in conversation, at least as a "sacred language" (G. H. Damant).

Chutney, written also CHUTNEE (Hindoo, *chatni*), a kind of pickle combining hot, sweet, and acid elements. The best chutney is imported from India, but there is also a home-made chutnee used in England, of which apple, capsicum, sultanas, and other things are ingredients.

Chyle (Greek, *chulos*, juice), the fluid which finds its way into the lacteals from the alimentary canal during the process of digestion. The terminal lacteals take origin in the villi (q.v.) of the small intestine, and transmit their contents through conduits of gradually increasing size, until the whole lacteal system becomes united in the single *thoracic duct* (q.v.). This main trunk finally opens into the large veins of the neck. Thus the chyle absorbed from the alimentary tract is ultimately discharged into and mingles with the blood. Chyle is a milky fluid containing about 9 per cent. of solid matter (proteids, fats, extractives, and mineral salts). It differs from the lymph of the lymphatic vessels in containing more fatty and proteid substances than the latter. The fatty matter is in an extremely finely divided state, and is called the *molecular basis* of the chyle. It is derived from the fatty constituents of the food, but some uncertainty exists as to the process by which the particles of fat are absorbed from the alimentary canal and conveyed into the lacteals. Chyle is coagulable, and contains cells called chyle corpuscles.

Chyme (Greek, *chumos*, juice), the term applied to the thick fluid which passes from the pyloric orifice of the stomach into the small intestine. The chyme is, of course, the ingested food as altered by the various processes it has undergone up to the termination of gastric digestion.

Cialdini, ENRICO, an Italian soldier, born at Castelvetro in Modena in 1811. He studied medicine, but was forced to take refuge in France for taking part in the Revolution of 1831. After fighting in the Spanish service against the Carlists, he returned to take part in the Italian rising of 1848, and being wounded, fell into the hands of the Austrians. When released he was employed to raise a regiment of Sardinian volunteers, at whose head he fought in 1849. He commanded a division in the Crimean war; and in the war of 1859 he gained the victory of Palestro. In 1860 he gained a victory over the papal army, and took Gaeta and Messina in 1861. In 1862 he was obliged, in his capacity of Governor of Naples, to act against Garibaldi. In 1866 he occupied Venice, and in 1876 went as ambassador to France. He returned with the rank of general of the army in 1881.

Cibber, COLLEY (1671–1757), English actor, dramatist, and poet, was the son of a German sculptor whose work is still to be seen upon the pedestal of the Monument at London Bridge. He was educated at Grantham, and in his nineteenth year entered Betterton's company of actors at Drury Lane. He played in *The Orphan* and in *The Double Dealer*, and in 1696 he played in his own comedy of *Love's Last Shift*, and secured his reputation. In 1704 he brought out his *Careless Husband* for himself and Mrs. Oldfield, and in 1712, when part owner and manager of Drury Lane, he brought out Addison's *Cato*. In 1715 he adapted the *Nonjuror* from Molière's *Tartuffe*, and on the death of Mrs. Oldfield, in 1730, followed by that of Wilks, one of his partners in the ownership of the theatre, he sold his share, and retired from the stage, having already been appointed Poet Laureate. An autobiographical *Apology for the Life of Colley Cibber* shows great merit, and if his powers as a dramatic writer were not great, at any rate he did much to elevate and purify the stage. He was severely criticised by Pope in the Dunciad, and spoken of with scorn by Johnson, who, however, approved of his *Apology*.

Cibrario, LUIGI (1802–1870), Italian historian and politician, was born at Turin, and studying the law, entered the State service, and soon became distinguished for his researches in history. At the Italian rising of 1848 he was appointed by Charles Albert commissioner at Venice, and senator of Sardinia. In 1852 he became minister of public instruction, and in 1855 foreign minister. Besides other works on history, numismatics, and different subjects he published (1839) *Economica Politica de Medio Evo; Storia della Monarchia di Savoia* (1840); and *Storia di Torino* (1847).

Cicadas, a number of insects belonging to the order RHYNCHOTA and forming the family Cicadidæ. They have suctorial mouths and four wings, and undergo an incomplete metamorphosis. The most interesting point about them is the presence in the males of the "abdominal drums" by which they make a harsh chirping noise. The female is songless; it has a piercing ovipositor, by which it bores into trees and there lays its eggs. Most of the Cicadas are tropical, but one species, *Cicada anglica*, Curt, occurs in England. They are usually known as locusts in America and Australia, but have no connection with those insects. The Cicadas include some of the largest of the Rhynchota.

Cicatrix (Lat. *cicatrix*, a scar), a scar. When an ulcerated surface heals there is a development of what is called scar tissue, or cicatrical tissue, and the process is termed cicatrisation. In the case of a skin wound the epithelium grows and extends so as to cover the site of injury, but the normal appearance is never completely regained, and a scar, or cicatrix, remains to mark the situation of the original breach of surface. The tissue of the scar beneath the epithelium is eminently liable to undergo contraction, thus leading in some instances to the production of serious deformity.

Cicero, MARCUS TULLIUS (106–43 B.C.), Roman orator, statesman, philosopher, and man of letters. Born in easy circumstances at Arpinum in Latium, he went to school at Rome to learn Greek philosophy and literature, law and rhetoric, thus fitting himself by wide study for forensic pleading and political oratory. After making his *début* at the bar as advocate for the defence in a criminal trial, at the age of 26 he went to Athens, coming back at the age of 30 to take his place as leader of the Roman bar. In 76 B.C. he was quæstor in Sicily,

and on behalf of the Sicilian populace he impeached Verres, the ex-governor, in 70, and drove him into exile by the mere eloquence of his opening speech. In 66 he was prætor, and made his great speech *pro Lege Manilia*, to advocate the appointment of Pompey to the command in Asia and the East. In 63 he was consul, and made his celebrated speeches *in Catilinam*, and foiled the conspiracy of Catiline, in which Cæsar is said to have been implicated. This at first brought him popularity, but the execution of Catiline by an order of the Senate was alleged to be a violation of the constitution, and the tribune Clodius so inflamed the people against him that in 58 he left Rome for safety, and was condemned to exile, and his houses were plundered. The next year he was almost unanimously recalled. He now took an active part in politics, at first standing aloof from both parties, but eventually giving his support (rather suddenly, and partly for personal reasons) to the combination formed by Pompey, Cæsar, and Crassus, his aid being valuable from his influence with the *bourgeoisie* of the Italian country towns. In 52 he made his speech *pro Milone*, in defence of Milo, who had killed Clodius ; in 51 he was governor of Cilicia. There he did much to restore the local liberties and protect the provincials from oppression. When difficulties arose between Cæsar and the Senate, whose champion Pompey was, Cicero decided, after much hesitation, to support the latter, as having, on the whole, constitutional right on his side. When Cæsar crossed the Rubicon, Pompey retired to Asia, and Cicero followed him, but was soon disgusted by the violence and threats of the Pompeians. The conqueror Cæsar received him as a friend, and during Cæsar's reign he lived in literary retirement, and wrote his greatest works. Late in life he was divorced from his wife Terentia, for no clearly assignable reason. But the year after Cæsar's death he again appeared in the Senate to deliver his Philippics against Antony, and in the same year he was put in the proscription list of the Triumvirate, and was put to death by Antony's soldiers. This was the only part of his later life in which he showed political decision. Though Cicero was a great orator, and many people find pleasure in reading his speeches, more are charmed by his essays and letters, and his *De Amicitia*, *De Officiis*, and *De Senectate* do not even to a schoolboy seem so dry and repulsive as many classics, and cannot fail to awaken thought, while to very many they are most pleasant companions.

Cicerone, a word of Italian origin and pronunciation, denoting a guide to public buildings and the like. The name is derived from Cicero, the Latin orator, and has reference to the eloquence or volubility which is characteristic of guides.

Cicinnus, a term applied to that kind of branching of the flower-bearing axis, also called a scorpioid cyme, in which each successive axis contributing to the *sympodium* (q.v.) is developed alternately right and left. (For example *see* DROSERA.)

Cicisbeo, an Italian word used in Italy to denote a gallant who attends a married woman to places of public entertainment and pays her all those attentions which a husband might be expected to provide. The word also denotes a bow and streamers of ribbon attached to a fan, or a sword, or a stick.

Cidaroida, an order of Sea Urchins (Echinoidea) which contains the well known genus *Cidaris*, and a few closely allied genera. The characters of the group are that the ambulacra are narrow areas with the plates simple and not fused into compound ones ; the spines and the plates (interambulacral) which bear them are both large : there are no external gills. The five arches which support the jaws are all incomplete. The genus *Cidaris* is the oldest surviving genus of Sea Urchins, as it commenced existence in Permo-Carboniferous times. The Chalk and Oolitic rocks yield many large species. (For terms *see* ECHINUS.)

Cid Campeador, the title of the Spanish hero Don Rodrigo de Bivar, the historical side of whose character has been almost obscured by the fanciful embellishments heaped upon it by minstrel and troubadour, and most English boys have at some time or other revelled in his exciting history as related by Southey in his *Chronicle of the Cid*, where poetry and prose are woven into a work of wonderful charm. A Castilian noble, born at Bivar or at Burgos about 1040, he was at 25 the virtual commander of the forces of Sancho II., of Castile. When Sancho was killed at Zamora, the Cid, with the other Castilians, acknowledged the banished Alfonso of Leon—brother of Sancho —as king. Alfonso gave to the Cid his own cousin Ximena in marriage, but could never forgive him for having been formerly his enemy, and in 1081 banished him from the kingdom. He now entered upon the life of a free lance, fighting for his own hand, now for the Christians, and now for the Moors, and finally making himself master of Valencia, where he reigned like a king in the company of his faithful wife. But in 1099 the Almoravides, who had been defeated by him, defeated in their turn one of his lieutenants, and the news is said to have killed the Cid, now toil-worn and battle weary. The heroic Ximena held Valencia for two years, and then carried with her to Burgos the embalmed body of the Cid, which for years was enthroned by the high altar of Cardeña. Historically the Cid seems to have been the true type and forerunner of the Spanish guerilla, and the Cid of romance may bear the same relation to him as Sir Walter Scott's Rob Roy to the historical Highland cateran. One of his Moorish enemies writing of him bears witness to his "love of glory, strength of character, and heroic courage."

Cider, an alcoholic beverage obtained by fermentation from apples. It is largely prepared in Gloucester, Devon, and Hereford, in Normandy, Holland, and the United States. The apples employed are generally bitter, but a well-selected mixture of bitter and bitter-sweet gives the best flavour. They are allowed first to mellow, and only those showing no sign of decay are employed. They are crushed by rollers, and the pulp is strained

by pressing through coarse hair-cloth bags either immediately after crushing or after having previously been allowed to stand for a few days in open vats. The liquid so obtained is placed in casks and allowed to ferment for three to ten days according to the strength required; it is then poured off from any sediment into clean casks and stored in cool cellars. In the following spring the cider is again poured off and casked or bottled. Good cider generally contains from 5 to 10 per cent. of alcohol and about 2 to 3 per cent. of sugar.

Cienfuegos, a port on the S. coast of Cuba, 140 miles S.E. of Havana, with which it is connected by railway. It has a considerable trade in sugar, molasses, rum, and wax.

Cieza, a Spanish town twenty-six miles N.W. of Murcia.

Cigar, a form of preparation of tobacco for smoking made by tightly rolling tobacco leaf, from which the stems have been extracted, and enclosing it in an outer layer of closely-fitting leaf. The ordinary cigar has one end open, and the other closed and pointed. The cheroot, lunkah, and trichinopoly have both ends open. One variety of cigar is manufactured by winding the tobacco leaf thinly at the ends and thicker in the middle around a central straw.

Cigarette, a diminutive of cigar, is the name given to a kind of cigar made by packing, somewhat loosely, tobacco cut to a considerable degree of fineness in an open-ended tube of tobacco husk, or more generally of paper. Till comparatively lately the practice of cigarette-smoking was hardly known in England. Now, however, it is well established among us, and the consumption daily assumes an enormous increase in spite of the many attacks made upon the practice, sometimes on the score of effeminacy, and sometimes on account of its alleged unwholesomeness. Much of its popularity, no doubt, is owing to the favour it finds among women, who not only encourage its use in their presence, but often find in it a mode of themselves enjoying tobacco without incurring the odium which would attach to using a pipe or cigar.

Cigoli, Luigi Cardi (1559–1613), an Italian architect, painter, and poet of the later Florentine school, who formed his style chiefly after Michael Angelo, Andrea del Sarto, and Correggio. Of his paintings an *Ecce Homo* at Florence gained a prize in competition, and was taken to the Louvre by Napoleon, but restored in 1815, and a *Martyrdom of St. Stephen* gained him the title of the Florentine Correggio. He died at Rome, whither he had been invited by the Pope.

Cilia, are minute vibratile hair-like processes, which are capable of rapid vibration backwards and forwards: they occur in most groups of animals. Their function is usually to create currents of water either for the collection of food, *e.g.* in the Rotifers and Brachiopoda, for respiration, as in the gills of Lamellibranchiate Mollusca, such as the mussel, or for the removal of excreta, as in the ciliated funnels of worms. In other cases they may serve for locomotion as in the case of *Paramecium*, the "Slipper animalcule." Their true nature is most easily seen in the Protozoa: they result from the attenuation of pseudopodia, the protoplasmic processes put forth by many of the lower members of that phylum [Amœba]; when these pseudopodia lose their direct locomotive function they may acquire the habit of merely vibrating in one plane; they then become much finer, and drawn out into cilia. One of the three great divisions of the Protozoa is known as the Ciliata (or Infusoria) owing to the importance of cilia to the members of this division; it is classified into orders according to the arrangement of the cilia.

Ciliata. [Infusoria.]

Ciliate, from the Latin *cilium*, an eyelash, is a term meaning "fringed with hairs," applied especially to the margins of leaves.

Cilicia, an ancient province of Asia Minor, now forming part of the Turkish province of Adana, comprised a large part of the southern coast from Pamphylia on the W. to the Syrian frontier on the E., and extending from the Mediterranean on the S. to Mount Taurus on the N., forming a narrow strip of 270 miles by 68. The western or mountainous part abounded in timber, and the eastern part was fertile, giving much corn and wine. Cilicia was taken by the Persians, then by Alexander, then became Syrian. Part of it was long the centre of a great piratical state, which was put down by Pompey; by whom it was made a Roman province in 67 B.C.

Cimabue. Giovanni (1240–1302), an Italian painter of Florence, and the founder of the Florentine school to which Michael Angelo, Raphael, and Leonardo da Vinci belonged. He was the first to leave the stiff traditional forms, and to copy from Nature and from the living model. Of his pictures the most remarkable are two Madonnas—one in the Academy at Florence, and the other in the church of Santa Maria Novella, the latter of which is a landmark in the progress of art, and was received with great enthusiasm at the time of its production, and was carried to the church in grand procession. Cimabue executed some notable frescoes at Assisi, and he had charge of the mosaic work of the Duomo of Pisa, some of his mosaics being considered the finest of the period.

Cimarosa, Domenico (1749–1801), an Italian operatic composer, educated at Naples. At 22 he had a reputation in all the theatres of Italy, and resided for four years at St. Petersburg as composer to Catherine II. of Russia. After passing some time at different German courts, he became Kapellmeister at Vienna, and finally returned to Italy, and died at Venice while meditating a return to St. Petersburg. Of his works, *Il Matrimonio Segreto* (1791) is his masterpiece, and ranks very high among light operatic music.

Cimbri, the name of an ancient Teutonic race whose location is somewhat doubtful, but who are generally considered to have inhabited the northern

part of Germany, and who are mentioned by Cæsar and other writers as having been formidable enemies of the Roman power, of determined courage, and capable of intense patriotic devotion.

Cimmerians, according to Homer, a race who dwelt beyond the Ocean Stream in a land of fog and darkness, identified at a later period as a Crimean race who dwelt about the Sea of Azoff and the lower course of the Volga. Metaphorically the word Cimmerian was applied as an intensive of darkness. Milton in *L'Allegro* bids loathed Melancholy "in dark Cimmerian desert ever dwell."

Cimon, died 449 B.C., son of Miltiades (q.v.), was born at Athens. He was imprisoned, through inability to pay a fine levied upon his father, until his brother-in-law paid it and released him. The struggle between Athens and Persia was then going on, and young Cimon, in conjunction with Aristides, who had taken him under his charge, was put in command of the Athenian squadron of the allied fleet under the Spartan Admiral Pausanias. Cimon captured a Persian garrison, and in 466 he almost annihilated a Persian fleet, and on the same day gained a land victory. He also drove the Persians out of Thrace and a great part of Asia Minor. He had now great influence at Athens, and his great bounty and lavish expenditure made him very popular. Later he led an army to the aid of the Spartans during the revolt of their serfs, but it was dismissed by them through want of confidence. On his return to Athens Pericles and the democratic party attacked him, and secured his banishment. After four years of exile he was recalled, and again took part in public affairs. He died during the siege of Citium, in Cyprus, held by the Persians; the "peace of Cimon," concluded shortly after his death, excluded Persian vessels from the Ægean.

Cinchona. [PERUVIAN BARK.]

Cinchonine, an alkaloid occurring, with quinine and other closely related substances, in cinchona bark. Its chemical composition is represented by the formula $C_{19}H_{22}N_2O$, and its constitution has been the subject of much research and speculation, but is not yet established. It crystallises in monoclinic prisms, melting at about 250° C., and in its physiological action resembles quinine, but is less marked.

Cincinnati, in the United States, is the largest city of Ohio, on the north bank of the Ohio river, which divides it from Kentucky, and is 270 miles from Chicago. Owing to the irregularity of its site Cincinnati presents a very picturesque appearance, and its suburbs are broken up by the hills into a series of villages and parks, of which Eden Park is the largest. The city, which has an area of 24 square miles, is well-built, and has some imposing public buildings, a university, several libraries, and a zoological garden. The wood-carving and decorative pottery of Cincinnati have a great reputation; and there is a considerable trade by the river and by the Miami and Erie Canal. There are extensive grain-elevators, stock-yards, and slaughterhouses for the immense hog trade which has gained for the city the name of Porkopolis, an honour, however, which is now divided with other towns. Incorporated in 1819, it had the title of "Queen of the West," and was and is a great home of culture and art.

Cincinnati, ORDER OF THE, in American history, was founded by the officers of the revolutionary army just before it was disbanded. Membership was restricted to themselves and their male descendants, and if the direct line failed collateral branches were eligible. It was denounced by several state legislatures as a military aristocracy, and discountenanced by Benjamin Franklin and other civilian leaders of the Revolution, and in 1784 Washington prevailed on the members to abolish the hereditary principle. In several states it still survives, and is recruited by co-optation, but it is safe to say that very few Americans are aware of its existence. The name is derived from L. Quinctius Cincinnatus (*see* below).

Cincinnatus, LUCIUS QUINCTIUS, an old Roman republican model of patriotic virtue and simple patriarchal manners. He was consul in 460 B.C., and at a crisis caused by the defeat of a consular army by the Aequi, was summoned from his plough to become Dictator. Having defeated the Aequi and saved the Roman army, he returned to his plough and little farm. Once more he was summoned at the age of 80 to take the helm of state as Dictator on the occasion of the conspiracy of Sp. Maelius.

Cinclides are the apertures through the mesenteries and walls of Sea-anemones, by which communication is established between the body cavity and the exterior, and between the various chambers between the mesenteries. [ACTINIA.]

Cineas (died 270 B.C.), a Thessalian, the friend and adviser of Pyrrhus, king of Epirus. His eloquence was so great that when sent on an embassy to Rome the Senate refused to hear him for fear of being charmed by it. Pyrrhus said that the eloquence of Cineas had won him more cities than his own arms.

Cineraria, a genus of Compositæ closely related to *Senecio*, the groundsels and ragworts. *C. cruenta*, the chief species, a native of Teneriffe, has broad, heart-shaped toothed leaves, and numerous heads with dark crimson disk-florets and a lighter ray. Seedling varieties have countless differences of colour in either disk or ray, white, purple, pink, etc. In our conservatories it keeps up a brilliant show of colour throughout much of the winter and spring.

Cinna, LUCIUS CORNELIUS, a Roman statesman belonging to the Marian faction. Sulla drove Marius out of Rome, and having himself to set out to conduct the war against Mithridates, King of Pontus, he made the Consul Cinna swear not to alter the existing political state of things. The latter, however, on Sulla's departure, impeached him in 87 B.C., and with Marius took the direction of affairs after a general proscription and massacre of the chief members of the opposite party. Three years later

he went out to meet and oppose Sulla, who was returning with his army and vowing vengeance, but at Brundisium Cinna was slain by his own soldiers. His daughter Cornelia was the wife of Julius Cæsar.

Cinnabar, the crude form of vermilion, the sulphide and chief ore of mercury (HgS). It is a cochineal-red mineral, generally massive, but sometimes crystallising in the Hexagonal system, with an adamantine lustre and a scarlet streak. Its hardness = 2·5 and its specific gravity 8. It is insoluble in nitric or hydrochloric acids, but soluble in aqua regia. Before the blowpipe it volatilises entirely on charcoal, but gives sulphurous fumes and a sublimate of mercury in the open tube. It occurs in limestone and slate, at Idria in Carniola, Almaden in Spain, China, Japan, Chili, Peru, Mexico, and California. It sometimes contains drops of pure quicksilver (q.v.).

Cinnamic Acid, an organic acid of composition $C_7H_7CO_2H_2$ occurring in many balsams (Tolu, Peru, storax, etc.), and in some benzoin resins. It crystallises in prisms, soluble in hot water, and may be prepared artificially by many different reactions, or obtained from *storax*. It is used in medicine as an aromatic stimulant, and sometimes to disguise the taste of disagreeable drugs.

Cinnamon, the inner bark of a small lauraceous tree (*Cinnamomum zeylanicum*) largely grown in Ceylon. The bark is stripped off two-year-old shoots in May and November and dried in the sun, undergoing a slight fermentation. It rolls up into quills, the thinnest being the best. Cinnamon contains a fragrant essential oil and has long been valued as a spice. It has also some medicinal value as a cordial and stomachic. Britain imports about 800 tons.

Cinq-Mars, Henri, Marquis de (1620–1642), son of Maréchal, the Marquis d'Effiat, and favourite of Louis XIII. He was introduced at court by Cardinal Richelieu, and his figure and manners soon made him a great favourite and secured his advancement. But his ambition outstripped his discretion, and looking on Richelieu as the great obstacle to the carrying out of his ideas he joined with the king's brother in a plot to murder the Cardinal. For his share in this conspiracy he was executed at Lyons. De Vigny has made his story the subject of a romance.

Cinquefoil, an architectural ornament consisting of a five-leaved opening of a conventional shape. The name has also been applied to certain groups of plants, and more particularly to the genus *Potentilla* in the rose-tribe.

Cinque Ports, originally the five ports of Hastings, Romney, Hythe, Dover, and Sandwich, with, in later times, the addition of Winchelsea and Rye. These ports supplied ships of war for the king's navy, and received in return some important privileges in the way of government, constitution and other. Their representatives are entitled to bear a canopy over the sovereign at coronation, and ships hailing from a cinque port are exempt from the payment of harbour dues.

Cintra, a Portuguese town in the province of Estramadura, 17 miles N.W. of Lisbon. There is an interesting palace at Cintra, once the residence of Moorish and afterwards of Christian kings, and showing a curious mixture of architectural styles. Cork convent in the neighbourhood is so called because the cells of the monks are lined with cork to keep out the damp. In 1808 a Convention—signed here—between the French and English, allowed the former to retain their arms and baggage on condition of evacuating Portugal. For this Convention the English generals were court-martialed.

Cippus, a small low column used by the ancient Romans as a mile-post or boundary stone. The name was also applied to a hewn stone marking a burial place. These are not to be confounded with the baetyls of the Phœnicians, which were probably meteorites, and were supposed to be animated by a deity. [Standing Stones, Stone Worship.]

Cipriani, Giambattista (1727–1785), an Italian painter and designer, was born at Florence, where he studied under an English painter. He then studied for three years at Rome, and in 1755 settled in London, where his drawings, engraved by Bartolozzi, became very popular and had much influence upon English art. In 1768 he became a foundation member of the Royal Academy, whose diploma was from his design, and he exhibited till 1779. He is also known as an etcher.

Circars, The, a former Indian territory on the coast of the Bay of Bengal, 100 miles by 18, and having an area of 17,000 square miles. The Circars—now part of the Madras Presidency—were ceded to the French by the native authorities in 1757. Lord Clive obtained their cession by the Court of Delhi to the East India Company in 1766, and they became an ordinary British possession in 1823.

Circassia, a territory bordering on the Western Caucasus, whose inhabitants, the Circassians, have in a great measure, upon the acquisition of their territory by Russia, migrated to Turkish territory in Asia Minor, or the mountains of Bulgaria. The race has long been noticed for the sturdy spirit of independence with which they have resisted Russian aggression, and for the beauty of their women, who are the chief ornaments of the Turkish harems. The nobles are generally Mussulmans, but the mass of the people profess a kind of rudimentary Christianity.

Circassians [Cherkess], the chief member of the Western Caucasian family [Caucasians II.], whose territory formerly comprised all the land from Abkhasia north-east to the Kuban basin. *Cherkess* is the Tatar, *Adighé* the national name, meaning "Highlanders." Numerous subdivisions at one time speaking no less than 72 distinct dialects, all very harsh and uncultivated; but the six Adighé tribes proper (full-blood Circassians) are the Nachvo, Natakhvo, Kobli, Sabich, Gvoghvo, and Sotokh, these last grouped in "brotherhoods," whose members are related to each other as brothers and sisters, and therefore cannot intermarry. Prevailing type:—middle size, fair complexion, blue eyes, hair of all shades, but red most common, broad

shoulders, robust figures. All are Sunni Mussulmans. Population (1859) 500,000, reduced after their final reduction by the Russians (1864) to 300,000, all of whom emigrated to Turkey except 76,000. These have been since further decreased, and at the end of 1880 none remained in their ancient homes, except a few scattered communities along the left bank of the Kuban. The country has been mostly re-settled by Russian immigrants. The Circassian exiles are now dispersed over Asia Minor and Turkey in Europe, where they are being gradually merged in the surrounding populations.

Circe, the great sorceress of ancient Greek folk-lore, whom Homer describes as a "fair-haired, clever goddess possessing human speech." She had the habit of changing human beings into the shape of wolves, lions, and other beasts, a power still possessed, according to Milton, by her son Comus, and she changed Ulysses' companions in this way, but Ulysses escaped by the use of the herb Moly, and lived with her a year, getting back his companions, and having generally no cause to complain of her treatment of him. She it was who, through jealousy, changed Scylla into a monster.

Circle, a well-known curve defined by Euclid as a plane figure bounded by a line such that every point on the line is equidistant from a certain point within the figure. This point is the *centre*, the boundary is called the *circumference*, and any line from centre to circumference is called a *radius*. All chords through the centre are therefore equal to twice the radius and are of equal length; such chords are called *diameters*, any one of which is an axis of symmetry of the figure. Other chords are equal if they lie at the same perpendicular distance from the centre; the length of a chord diminishes as its distance from the centre increases. The length of the circumference is a constant multiple of the diameter for all circles. Archimedes showed that this multiple, which is generally denoted by the Greek letter π, was nearly $\frac{22}{7}$. Other fractional approximations have been supplied, the neatest and best remembered being that of Metius $\frac{355}{113}$. The exact multiple is incommensurable, that is, it cannot be expressed in a finite number of figures. It follows that all attempts to "square the circle," *i.e.* find a square of area exactly equal to a given circle, must be fruitless. It has been calculated to over 700 figures of decimals, starting thus—3·14159265358979. Metius' fraction is correct to six decimal places. The circle is the only plane curve with the same curvature at every point. The curvature at every point in a straight line is the same, but is zero; in this sense we understand a straight line to be a special circle of infinite radius. Of all plane figures with the same circumference or perimeter, the circle has the greatest area. This area is π times the square of the radius.

The circle is one of the conic sections, being obtained by cutting a right circular cone perpendicularly to its axis. In fact it may be treated as a special case of ellipse, with the two foci coincident, the directrices at infinity, and the two axes equal. As a conic, therefore, it can be cut by a straight line in two points only, and from any point only two tangents can be drawn to it; these two tangents are equal to each other.

The *circular measure* of an angle (q.v.) is of great importance in theory. Any angle at the centre of a circle of unit radius subtends a circular arc, whose length is proportional to the angle, and is therefore a measure of it.

Circle, Arctic, is a circle round the north pole at the uniform angular distance of $23\frac{1}{2}°$. It, therefore, is identical with the line of north latitude $66\frac{1}{2}°$. It separates the Arctic from the North Temperate zone, just as in the southern hemisphere the Antarctic circle separates the Antarctic from the South Temperate zone. Inasmuch as $23\frac{1}{2}°$ is the angle of obliquity of the earth's equator to the ecliptic, there are periods of the year when the sun never sets during a day, and other periods when it never rises during the day, in the Arctic and Antarctic regions.

Circle, Declination. [Declination.]

Circle, Great and Small. Any plane section of a sphere cuts the surface in a circle. *Great circles* are those obtained when the plane of section passes through the centre of the sphere; lines of longitude and the equator are examples of great circles on the earth. The shortest distance between two points on a sphere is along the great circle containing those points; hence, *great-circle sailing* in navigation. All other sections of a sphere form *small circles;* examples of these are seen in the Arctic and Antarctic circles, and in all other lines of latitude excepting the equator.

Circle, Magic. [Invocation, Magic.]

Circle, Meridian, of an observer is the great circle on the celestial sphere through the pole, and through the zenith of the observer. The sun crosses his meridian at mid-day.

Circles, Stone. [Standing Stones, Stonehenge.]

Circuit, Electric. When two points are connected by an electrical conductor, between which points a definite difference of potential may be kept up, a circuit is said to be formed, and a current will be set up whose strength is proportional to the magnitude of the electromotive-force supplied, and to the conductivity of the complete circuit. If the circuit be broken, *i.e.* if the continuity of the conductor from the one given point to the other be disturbed by the introduction of a very high resistance, then the transfer of electricity is practically stopped. The quantity of electricity displaced per second across any section is the same for all parts of the circuit, and is a measure of the strength of the current. [Coulomb.] The energy spent per second during the flow of the current through any part of this circuit may be understood to be the energy lost by the above quantity lowering its potential. If A is the current in *ampères*, and V the potential-difference in *volts* at the two ends of the specified portion of the circuit, AV measures the energy given per second to that portion, and AV ÷ 746 gives us at once the

horse-power employed. This is a very useful expression in practical work. [ELECTRICITY.]

Circuits. These are the routes taken by the several judges of the Supreme Court in holding the assizes. Considerable alterations in them were made by the Judicature Act, 1875, and by the orders in council made pursuant to such Act on Feb. 5 and May 7, 1876, and June 26, 1884. They now are as follows:—

1. *The Northern Circuit*, comprising the counties of Westmoreland, Cumberland, and Lancaster; the Assize towns being Appleby, Carlisle, Lancaster, Manchester, and Liverpool.

2. *The North-Eastern Circuit*, comprising the counties of Northumberland, Durham, and York, and counties of the town of Newcastle-on-Tyne and city of York; the assize towns being Newcastle, Durham, Leeds, and York.

3. *The Midland Circuit*, comprising the counties of Lincoln, Nottingham, Derby, Warwick, Leicester, Northampton, Rutland, Buckingham, and Bedford, the counties of the city of Lincoln and town of Nottingham; the assize towns being Lincoln, Nottingham, Derby, Warwick, Leicester, Northampton, Oakham, Aylesbury, and Bedford.

4. *The South-Eastern Circuit*, comprising the counties of Norfolk, Suffolk, Huntingdon, Cambridge, Hertford, Essex, Kent, and Sussex, and county of the city of Norwich; the assize towns being Norwich, Bury St. Edmunds, or Ipswich, Huntingdon, Cambridge, Hertford, Chelmsford, Maidstone, and Lewes.

5. *The Oxford Circuit*, comprising the counties of Berks, Oxford, Worcester, Stafford, Salop, Hereford, Monmouth, Gloucester, and counties of the cities of Worcester and Gloucester; the assize towns being Reading, Oxford, Worcester, Stafford, Shrewsbury, Hereford, Monmouth, and Gloucester.

6. *The Western Circuit*, comprising the counties of Southampton, Wilts, Dorset, Devon, Cornwall, Somerset, and counties of the cities of Exeter and Bristol; the assize towns being Winchester, Devizes or Salisbury, Dorchester, Exeter, Bodmin, Taunton, or Wells, and Bristol.

7. *The North and South Wales Circuit*, comprising *North Wales Division*, the counties of Montgomery, Merioneth, Carnarvon, Anglesea, Denbigh, Flint, and Chester. *South Wales Division:* Counties of Glamorgan, Carmarthen, Pembroke, Cardigan, Brecknock, and Radnor, and counties of the borough of Carmarthen and town of Haverfordwest; the assize towns being Welshpool, or Newtown, Dolgelly, Carnarvon, Beaumaris, Ruthin, Mold, Chester, Cardiff, or Swansea, Carmarthen, Haverfordwest, Cardigan, Brecon, and Presteign. The places, and also, as far as may be, the days for holding assizes, are fixed, and various other regulations as to circuits made by the "Circuits Order, 1884" above referred to.

The Circuit Courts of Justiciary in Scotland are very similar in constitution to the Assizes in England in criminal matters, but in civil causes their jurisdiction is limited to the hearing of appeals from local tribunals. There are three circuits in Scotland (the north, south, and west).

Circuity of Action is where a litigant by an indirect and circuitous course of proceeding makes two or more actions necessary in order to obtain the rights of all parties interested, which by a more direct course he might have attained in a single action. For example, where a defendant in an action on contract, instead of showing a case for mitigation of damages, allows the plaintiff to recover the full amount of the contract in the first action, and then commences a cross-action to regain the amount which he might have set-off as against plaintiff's claim in first instance. Formerly, indeed, the defendant was compelled to bring a cross-action, there being no other remedy; but now evidence in mitigation of damages can be given and circuity of action thus avoided.

Circular Measure. [CIRCLE.]

Circular Notes are a kind of bank-notes personal to the bearer, and are supplied by bankers to travellers with a list of foreign bankers who may be asked and expected to cash them. They are generally accompanied by a letter of identification on which the traveller has signed his name, and foreign bankers may ask for his signature for the sake of comparing it with that appearing upon the letter, and so obtaining greater security of identity.

Circulation of the Blood. The course of the circulation in mammals (and birds) is diagrammatically represented in the accompanying figure. Arterial blood coming from the lungs reaches the left auricle *a* by the pulmonary veins *l*; from the left auricle it is conveyed into the left ventricle *b*, and thence is forced by the ventricular contraction into the aorta. In its course from *b* to *c*, *i.e.* from the left ventricle to the right auricle, the blood completes the *systemic* part of the circulation. The aorta and its branches, by repeated division and subdivision, merge into the capillary network *g* of the several parts and organs of the system; and the blood of the capillaries is gradually collected again by the veins and conveyed back to the heart at *c*. From the right auricle *c* the next step is to the right ventricle *d*, and then the blood is forced into the pulmonary artery *h*, and traverses from *h* to *l*, the *pulmonary* part of the circulation. Arrived at *l*, the circle is completed. The systemic and pulmonary parts of the circulation are sometimes called the greater and the lesser circuits respectively.

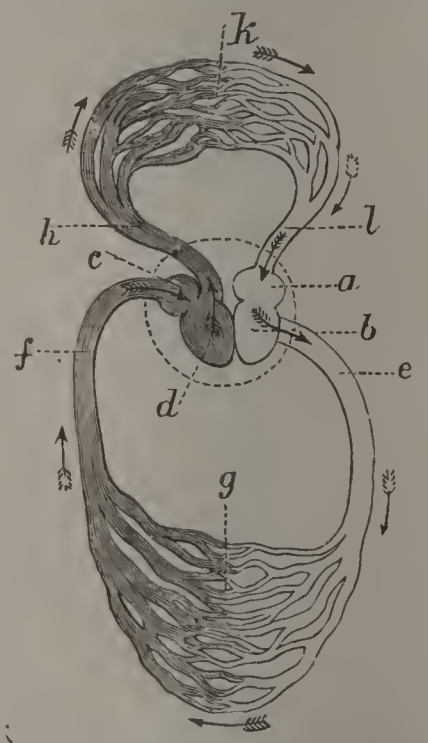


DIAGRAM SHOWING THE COURSE OF THE CIRCULATION OF THE BLOOD.

The right and left auricles contract simultaneously, and so do the right and left ventricles [HEART]; so that at the same instant that the

contents of the left ventricle are discharged into the systemic vessels, the contents of the right ventricle are propelled into the pulmonary vessels. The amount of blood discharged at each ventricular contraction is in an adult about four ounces, and it has been calculated that the complete round of the circulation can be made by substances injected into the blood-stream in about two minutes. In the greater and lesser circuits, as already described, only one system of capillaries is traversed by the blood, on its way from left ventricle to right auricle, or from right ventricle to left auricle. Under certain circumstances, however, there is a double capillary system interposed in the path of the blood from the left ventricle to the right auricle. Thus, the veins of the stomach and intestines receive the contents of the capillaries and join together to form the *vena porta*, and then this great vein, instead of directly proceeding to the heart, breaks up again into a second capillary system in the liver. This peculiar portal circulation, as it is called, will be described in connection with the liver (q.v.). Again, in the kidney (q.v.), there is a double capillary system.

The facts concerning the circulation of the blood as just detailed have only been made out within quite recent times. It was supposed by the ancients that blood was carried from the heart to distant parts of the body by the veins; while the arteries, being found empty after death, were credited with conveying some kind of air or vital spirit to the tissues. Galen first showed that the arteries did actually contain blood, in addition—as he maintained—to the vital air. Communication between the right and left sides of the heart he supposed to be brought about by minute invisible openings in the septum between the ventricles. These doctrines were generally accepted for many centuries. The first step in advance was made by Servetus. This anatomist, writing in 1553, suggested the possibility of a means of communication existing in the lungs between the blood of the pulmonary artery and that of the pulmonary veins. It was, however, William Harvey who first conceived the idea of the circulation of the blood, and to him is due the honour of demonstrating the same by a series of masterly experiments and deductions. Harvey conclusively showed that the blood in the veins and in the arteries is the same blood; that the connection between the right and left sides of the heart is not by direct openings in the septum, but that all the blood of the right ventricle is sent through the pulmonary arteries, by way of the lungs, to return to the left auricle by the pulmonary veins; while, similarly, the whole of the blood of the left ventricle is returned by the great veins to the right auricle. In Harvey's great work—*Exercitatio de Motu Cordis et Sanguinis*—published in 1628, he describes his observations on living animals, and the experiments which he conducted to show the effect of blocking the blood-stream in particular situations by ligatures or by compression. He shows that the heart is a muscular organ, points out that the arrangement of the valves is such that blood can only flow in one direction, and demonstrates the same principle in the case of the valves of the veins. Lastly, he adduces the effect of poisons introduced at a single point upon the system generally, as an additional proof of the truth of his contentions. The advances made by science in the last twenty-five years have abundantly confirmed the truth of Harvey's ideas; in particular, the employment of the microscope has supplied the means of tracing by actual observation the course of the blood through the capillary network. Thus, to-day, the merest tyro can witness in the web of a frog's foot the marvellous race of blood corpuscles through the small arteries, their distribution into, and slower progress through, the capillaries, and their gathering together again in the venules. It is difficult for the modern student to understand how so obvious a condition of things should have remained undiscovered for so many hundreds of years, and the greatness of Harvey's discovery is well nigh overlooked in the confusion of its abundant confirmation.

Physiology of the Circulation. It is now necessary to discuss the circulation from a mechanical standpoint, and to inquire into the several conditions of pressure and of velocity of flow which obtain at different points.

The three factors which are of first importance are: the force and frequency of the heart's beat, the elasticity of the arteries, and the capillary resistance. The heart's action is intermittent; each complete cardiac cycle [HEART] occupies about $\frac{8}{10}$ of a second. With each ventricular systole a fresh amount of blood is propelled into the arteries, the capillaries offer a certain resistance to its onward flow, and hence the result of the repeated injection of fresh quantities of fluid is to bring about a condition of distension of the highly elastic coats of the large vessels. But the arterial walls being ever on the stretch, are ever tending to contract upon their contents; hence, during the period when the left ventricle is passively dilating, the arterial tension must make itself felt, and tend to drive some of the blood out of the large arteries. It cannot drive it back into the heart, the semilunar valves [HEART] excluding the possibility of a backward flow; therefore, it must drive it onward. In other words, the flow of blood through the capillary network is not affected by a series of forward movements corresponding with each emptying of the left ventricle, but takes place during the dilation as well as during the contraction of the ventricle. The flow in the capillaries is, in fact, continuous and not intermittent.

The pressure of the blood in the large vessels has been investigated by means of the mercurial manometer. An artery or vein is exposed and the flow of blood through it controlled by pressure forceps, a canula, *i.e.* a suitably-shaped tube, is then introduced (in the case of an artery, so that the pressure forceps lies between the heart and the canula opening) and connected by a leaden pipe with a U-shaped tube containing mercury. The apparatus is filled with a saline solution, so as to obviate escape of blood from the artery into the system of tubes with which it is now continuous. Moreover, the mercury in the far limb of the tube is raised by pressure to a height such as it is judged will be

necessary in order that the column of mercury supported will just about correspond with the pressure of the blood. It is clear, then, on removing the pressure forceps, and placing the blood inside the artery in direct continuity with the fluid in the canula and the leaden tube, that the variations in pressure inside the vessel will be represented by oscillations in the column of mercury. If a piston attached to a marking point be allowed to float on the free surface of the mercury, the marking point will oscillate and may be caused to record its oscillations on a revolving drum. In this manner tracings representing the alterations of level of the manometer column have been obtained, and such a tracing is called a blood-pressure curve.

It is estimated that the average pressure in the carotid artery of man is about equivalent to the weight of a column of mercury six inches high. The blood pressure rapidly diminishes on proceeding towards the periphery, and still further diminishes on passing from the capillaries to the veins. Indeed, in the large veins near the heart the pressure is very low.

The velocity of the blood, on the other hand, while it is greatest in the large arteries and decreases towards the capillaries, begins to increase again on passing from the capillaries to the veins. This, of course, arises from the fact that the velocity depends upon the calibre of the channels through which the blood is flowing. Cooped up within small dimensions in the aorta, the blood flows very rapidly (about one foot per second in man); as it approaches the capillaries, it is distributed into multitudinous channels, which, though minute individually, are collectively of much greater sectional area than the main artery from which they originate. Hence, in the capillary network, the movement of the blood may not exceed a rate of one inch per minute. When, however, the capillaries merge into veins, the gross sectional area diminishes again and the velocity increases.

It must not be imagined that the blood pressure and the rapidity of flow in a particular vessel are fixed quantities. On the contrary, in accordance with the requirements of the parts and organs of the body, modifications are effected in the local or general circulation. These modifications are brought about through the mediation of the nervous system. [Vasomotor Nerves.]

In certain organs local peculiarities in the circulation are recognisable. The liver and kidneys have already been alluded to, and will be fully dealt with under the articles devoted to their consideration. In erectile structures special conditions obtain, the venous sinuses permitting of great distension by increased afflux of blood. The capillaries of the lungs again present peculiarities. [Lungs.] Lastly, the circulation in the brain differs in several respects from that in other parts of the body. [Brain.] The large arteries supplying the brain, passing as they do through bony canals, are incapable of becoming much distended; moreover, by their tortuous course and free anastomosis the impetus of the blood in them is modified and uniformity of blood supply ensured. Again, the large venous sinuses of the cranial cavity present unique characters.

Circumcision, the practice of cutting away the prepuce of males, and in some countries that of females also. The practice prevailed among many ancient peoples, and obtains in various parts of the world at the present day, notably among the Jews and the Mohammedans. Various reasons have been suggested for the adoption of the rite, some thinking it to have had a religious origin, some thinking it a sacrifice to malignant powers, others thinking that it was adopted in hot countries simply from motives of cleanliness. In the Christian Church the Circumcision (January 1) is the festival that commemorates the day of Christ's circumcision.

Circumference, in the ordinary sense, is the curve which encloses a circle, ellipse, or other plane figure, the word *perimeter* being generally employed if the boundary is made up of straight lines, as with the square, hexagon, or other polygon. The circumference of a circle or ellipse is longer than the perimeter of any ordinary inscribed polygon [Polygon], and shorter than that of any circumscribed polygon. Strictly speaking, a circle is the curve itself, not the space enclosed by the curve; it is a line, not an area. The length of the circumference of a circle bears a definite ratio to the length of its diameter, this ratio being the same for all circles. It is the same ratio that the area of the circle bears to the square on its radius, or that the area of an ellipse bears to the rectangle contained by its two semi-axes. [Circle.]

Circumferenter, an instrument used in surveying, for the measurement of horizontal angles by means of a magnetic needle. [Surveying.]

Circumnavigation, the act of sailing round, and generally applied to the voyage round the world as made by Anson, Cook, and many others.

Circumstantial Evidence. [Evidence, Witnesses.]

Circumvallation, a system of fortification or defence carried round any place; but the word is more usually applied to a line of defence carried round the rear of a besieging army, and having for its object the protection of such army from the possible attack of an army advancing to the relief of the besieged place.

Circus, the building appropriated in a Roman city to the holding of games, horse-racing, and wild-beast or gladiatorial shows. In racing, the line of the longitudinal axis was marked by a low barrier, round the end of which the chariots turned. The circus received a new interest in early Christian times from being the scene of many a Christian martyrdom. A circus in modern times is a round building or enclosure generally of a temporary nature, used for the exhibition of feats of horsemanship and the like, and also to denote the exhibition that takes place therein. In architecture a circus is a kind of widening out of a street where crossed by another by cutting off the corners and arranging the buildings in a circular form. Examples are Oxford and Piccadilly Circuses.

Cirencester (locally pronounced *Cissiter*), the ancient Roman Corinium, at the junction of several Roman roads, and in a neighbourhood abounding in Roman antiquities, is a town of Gloucestershire in the Cotswold Hills, on the Churn, a feeder of the Thames, and traversed by the Thames and Severn Canal. It is 18 miles from Swindon, and 14 from Cheltenham. It has a good trade in wool and agricultural produce, and is a great hunting centre. Near it is the seat of Earl Bathurst. There is a good agricultural college in the neighbourhood. The town was twice stormed during the Civil war.

Cirrhosis (Gk. *kirrhos*, yellow), a term primarily applied to a disease of the liver, in which that organ becomes shrunken, and its surface irregular, while a section of it is found to present a yellowish orange colour. Cirrhosis appears to commence as an inflammatory process involving the connective-tissue sheath of the smaller branches of the portal vein ; fibrous tissue is developed between the liver lobules, and at first the whole organ is increased in size ; but the new-formed connective tissue soon undergoes cicatricial contraction, the liver shrinks, and its functions are gravely embarrassed. In the process of contraction bosses or lumps are developed on the hitherto smooth liver surface, hence the term *hobnail liver* which has been applied to the organ when thus affected. Cirrhosis is generally caused by the abuse of alcohol, and of all forms of such abuse the long-continued drinking of gin is particularly associated with the development of the cirrhotic condition. Indeed "gin-drinkers' liver" is a well recognised popular designation for cirrhosis. The early symptoms of cirrhosis are somewhat variable, the progress of the disease being very insidious. Most habitual drinkers suffer from gastric derangement, apart from cirrhosis ; again, the emaciation and failing strength of commencing cirrhotic mischief are symptoms common to it and to many other forms of disease. The appearance of abdominal dropsy or ascites (q.v.), or of the vomiting of blood, or of the passage of blood per rectum, are characteristic symptoms of cirrhosis, but unfortunately such symptoms point to the fact that the morbid process is already considerably advanced. Jaundice is rarely very marked, usually present in the final stages. The disease, when once fairly established, is almost always fatal within one or two years. Hypertrophic cirrhosis, as it is called to distinguish it from the gin-drinkers' or atrophic form, is a much rarer variety of disease of the liver. The term cirrhosis is also employed to designate certain affections of other organs (as for example the lungs and kidneys) in which a new development of fibrous tissue occurs, with subsequent contraction and induration. In thus using the word cirrhosis its etymology is completely ignored.

Cirripedia, an order of CRUSTACEA, of which the best known forms are the Acorn shell and the Barnacle. They belong to the group of Crustacea known as the Entomostraca, which includes all the small, simply organised forms, with a very variable number of appendages and somites ; thus they are allied to *Apus* on the one hand, and *Daphnia*, the "water flea," on the other. The Cirripedia are the most clearly-marked off division of the Entomostraca, as their fixed mode of life has led to much degeneration in structure ; thus they have lost all organs of locomotion and special sense, and any trace of segmentation. They are fixed by the antennæ, which are modified into "cement glands" ; the other appendages of the head, except the mandibles, palps, and maxillæ, are lost ; there are five pairs of two-branched thoracic appendages, which form a crown of fine long tentacles, by the motion of which are set up currents of water, which bring the animal its food. The shell is composed of many pieces or valves. [BARNACLE and BALANUS.] There is a marked metamorphosis ; the first stage after the egg is a "Nauplius," a small unsegmented larva provided with three pairs of cephalic appendages, and a large median eye. The Cirripedia are divided into three orders : the Apoda, the Abdominalia, and the Thoracica ; the last includes the three best-known families, the Balanidæ (including the Acorn Shells), the Verrucidæ, closely-allied forms, and the Lepadidæ or Barnacles. Amongst other interesting features in this group is the fact that in some of them the males are dwarfed, degraded forms, parasitic upon the female, whose fertilisation is their sole duty ; they are therefore known as "complemental" males. The British species, both recent and fossil, have been monographed by Darwin.

Cisalpine Republic, an artificial republic formed out of his Italian conquests by Napoleon in 1796 after the battle of Lodi. It embraced the territory on both sides of the Po, and had an extent of 16,000 square miles, having Milan as its seat of government. Dissolved three years afterwards, it was revived as the Italian Republic, and it chose Bonaparte as Director, electing him King of Italy in 1805. It finally ceased to exist at the fall of Napoleon in 1814.

Cissoid, a curve of much interest in higher geometry. It may be drawn in the following manner :—A circle is described on a line A B as diameter ; the tangent E B F is drawn touching the circle at B, and points C_1, C_2 . . . , on this tangent are joined up to A. Such lines all cut the circle at, say, D_1, D_2 . . . , and if on these lines A O_1, A O_2 . . . , are marked equal to C_1 D_1, C_2 D_2 . . . . , the points O_1, O_2. . . . will lie on the cissoid.

Cissus, a genus of plants closely related to the grape-vine, but having usually four petals instead of five, which fall off separately. They are mostly natives of tropical Asia, *C. discolor* being one of the most beautiful foliage-plants of our hothouses.

Cistercians, a monastic order founded by Abbot Robert in 1098 at Coteaux (Cistercium) near Dijon. The order followed the rule of St. Benedict, and being exempt from episcopal control formed an ecclesiastical republic. St. Bernard of Clairvaux almost refounded the order, to which belonged the Feuillants of France and the nuns of Port Royal. The Trappists are an offshoot of it. The habit is white with black scapular, and a large white surplice with hood is used in ministrations.

Cistus, a genus of shrubs, natives of Southern Europe, North Africa and the Canaries, which gives its name to the order *Cistaceæ*. They have opposite simple lanceolate leaves and handsome rose-like but fugacious flowers which only open in sunshine. They have five sepals, five petals, indefinite stamens and a capsule imperfectly divided into five or ten chambers. This last character distinguishes the genus from our wild *Helianthemum*, or rock-rose, in which there are only three partitions. *C. creticus*, with purple petals having a yellow spot at their base, and *C. ladaniferus*, a native of Spain and Portugal, with white flowers with a purple spot, yield the balsamic oleo-resin *labdanum*, used in fumigation. Many other species of "Gum Cistus" are grown in our gardens.

Cistvaen, Cist. [BARROW.]

Citation, a proceeding to compel the appearance of a party in court to answer a claim. It is more particularly applicable to the Probate and Divorce Division of the High Court of Justice, where the party to be affected by the order of the Court is served with a citation issuing from the High Court of Justice, the object of which is to compel a representation to be taken by those who are primarily entitled to it, or to provide a substitute upon a voluntary renunciation on their part. In the Ecclesiastical Courts generally the issue of a citation is the usual mode of commencing a suit. It is the judicial act by which a defendant is commanded to appear in the suit.

Citizen. Aristotle defines a citizen as one who participates in the executive, judicial, and legislative power in a state, but he observes that his definition strictly applies only to a democratical form of government. The Roman word *civis* in its original and proper sense also meant one who had some share in the sovereign power of the State, though it was occasionally applied in a broader sense to subjects of the Roman State. The word citizen, then, in its historical sense, cannot apply to those who are the subjects of a despotic monarch, nor to those persons under any form of government who have no share of political power. Continental publicists frequently distinguish "active citizens," who have some share of political power, from "passive citizens" (non-voters, including women and children), who have no political rights. Citizenship is usually acquired by birth, by being born of citizens. [NATURALISATION.] In most of the old Greek states, and in those states of antiquity where citizenship existed, this was the only mode in which, as a general rule, it could be acquired.

Citric Acid, a tribasic acid of the composition $C_6H_8O_7$ which occurs largely in the juice of many fruits, as lemons, gooseberries, currants, etc. It is chiefly obtained from lemon or lime juice, in which it occurs to about 8 per cent., by addition of chalk, and treatment of the *calcium citrate* so obtained with the required quantity of sulphuric acid. It forms rhombic crystals easily soluble in water, and possesses a very sour taste. Its salts are termed *citrates*, and some are employed medicinally, as citrate of iron, citrate of iron and quinine, both well-known tonics. Citrate of magnesia consists chiefly of a mixture of tartaric acid, citric acid, and bicarbonate of soda, and contains but little magnesia. The acid and its salts are also used for photographic purposes.

Citron (*Citrus medica*), an erect glabrous tree with spinous branches when wild, native to India, but cultivated in various forms in prehistoric times. Its young shoots and the outer surface of its petals are tinged with red, and the fruit is longer than it is wide, ends in a nipple-like point, has a rough, light yellow and often thick skin, and generally an acid juice. Sir D. Brandis and Sir J. Hooker distinguish four varieties, the citron, lemon, lime and sweet lime, the last being said to be wild in the Nilgherries, whilst the citron and the lime are identified with old Sanscrit names. The Jews probably brought the citron from Babylon, and they still carry its fruit at the Feast of Tabernacles. Theophrastus and Dioscorides (q.v.) speak of it as the apple of Media and of Persia, whence it gets its specific name; but it does not seem to have been cultivated in Italy till the third or fourth century of our era. The Arabs extended its cultivation, and it is now also grown in China, Japan, and Jamaica. The fruit is oval or nearly spherical, and is sometimes six inches long.

City, a word used in England generally to designate a town which is or has been the seat of a bishopric. Sometimes, and especially in America, the word denotes any large or important town, *e.g.* New York City. It is also sometimes used generically as opposed to country. The City of London is that part of the English metropolis which is under the sway of the Lord Mayor. It extends from the site of Temple Bar in the west to the Tower in the east, and as far as Finsbury on the north.

City of Refuge, any one of six cities in ancient Palestine, which were set apart as sanctuaries for those who had unwittingly committed manslaughter. Three on the east of the Jordan—Bezer, Golan, and Ramoth—were established by Moses, and three on the West—Hebron, Kadesh, and Shechem—were set apart by Joshua. Medina became a city of refuge to Mahomet.

Ciudad Real, or ROYAL CITY, a Spanish town in the province of the same name, 105 miles from Madrid, and on a plain near the Guadiana. It has a small trade and some woollen and linen manufactures, and contains a fine Gothic church, and a good gateway in the ruins of the old town walls.

Ciudad Rodrigo, a Spanish town on a hill above the Agueda, 56 miles from Salamanca, and 17 from the Portuguese frontier. It was taken by the English and French in the war of the Spanish succession, and surrendered in 1810, after a gallant defence, to General Massena. In 1812 Wellington took it by storm after a siege of eleven days, and for this deed was made an Earl in England, and by the Spanish, Duke of Ciudad Rodrigo.

Civet, Civet-Cat, any species of Viverra, the type-genus of the Æluroid family Viverridæ, from the warmer regions of the Old World, containing forms closely allied to the True Cats and to the

Hyænas. These are of small or moderate size, with sharp produced snout, and long tail, and are all more or less striped or banded ; the tongue is rough with papillæ, some of the molars are tubercular, and the claws are partially retractile. The true Civet is the African *Viverra civetta*, a small nocturnal beast, which supplements its flesh diet with roots and fruit. Its Indian congener [ZIBETTA] also

CIVET-CAT.

yields civet—a pomade-like substance secreted in an anal pouch, whence it is scraped out with a spatula. This "uncleanly flux of a cat" was formerly in repute as a medicine, as it continued to be till comparatively recent times as a perfume, for which purpose it is still used in the East.

Civil Death. [DEATH.]

Civil Law. By the Civil Law is generally understood the Municipal Law of the Roman Empire, as comprised in the Institutes, the Code and the Digest of the Emperor Justinian, and the novel constitutions of himself and some of his successors. Of this body of Law the following is a short and general account :—

The Roman Laws—founded first upon the regal constitutions of their ancient kings, next upon the twelve tables of the *decemviri*, then upon the Laws or Statutes enacted by the senate or people, the edicts of the Prætor, and the *responsa prudentium* or opinions of learned lawyers, and, lastly, upon the imperial decrees, or constitutions of successive emperors—had grown to so great a bulk that they were computed to be many camels' loads by an author who preceded Justinian. This was in part remedied by the collections of three private lawyers, Gregorius, Hermogenes, and Papirius, and then by the Emperor Theodosius the younger, by whose orders a Code was compiled A.D. 438. being a methodical collection of all the imperial constitutions then in force : which Theodosian Code was the only Book of Civil Law received as authentic in the western part of Europe till many centuries after, and to this it is probable that the Franks and Goths might frequently pay some regard in framing legal constitutions for their newly created kingdoms. It was under the auspices of the Emperor Justinian that the present body of Civil Law was compiled and finished by Tribonian and other lawyers about the year 530.

This consists of :—1. *The Institutes*, which contain the elements or first principles of the Roman Law in four books. 2. *The Digests or Pandects*, in fifty books, containing the opinions and writings of eminent lawyers, digested in a systematical method. 3. *A New Code or Collection of Imperial Constitutions*, in twelve books,—the lapse of a whole century having rendered the former Code of Theodosius imperfect. 4. *The Novels or New Constitutions*, posterior in time to the other books, and amounting to a supplement to the Code containing new decrees of successive emperors as new questions happened to arise. These form the body of Roman Law, or *Corpus Juris Civilis*, as published about the time of Justinian, which, however, fell soon into neglect and oblivion until in the 12th century the policy of the Roman Church began to give new vogue and authority to the Civil Law, introduced it into several nations, and occasioned that mighty inundation of voluminous comments with which this system of law more than any other is now loaded. Scots law, and the law of many Continental countries, owe much to Roman law.

Civil List, an annual sum granted by Parliament at the commencement of each reign for the expense of the Royal Household and Establishment, as distinguished from the general exigencies of the State, it being the provision made for the Crown out of the taxes in lieu of the Crown's proper patrimony, and in consideration of the assignment of that patrimony to the public use. This arrangement has obtained from the time of the Revolution downwards, though the amount fixed for the Civil List has been subject in different reigns to great variation. At the commencement of the present reign, by the "Civil List Act" a Civil List was settled on Her Majesty for life to the amount of £385,000 per annum, payable quarterly out of the Consolidated Fund. Of this, the sum of £60,000 is assigned for Her Majesty's private purse, the remainder being applicable to the salaries and expenses of her household. By the above-named "Civil List Act" the Queen is also empowered to grant pensions to the amount of £1,200 per annum, chargeable on her Civil List revenues, as a provision for those who have just claims on the Royal beneficence, or by their services or discoveries have merited the gratitude of their country.

Civil Service. One of the three great branches of the public service of the State, the others being the Army and the Navy. It includes the executive departments of the Treasury, Home Office, Foreign Office, Colonial Office, Local Government Board, Board of Trade, etc., the great revenue departments of the Customs, Inland Revenue, and Post Office, the administration of Law and Justice, Education, Science and Art, and the Diplomatic and Consular services. The expenditure of each Civil Department is estimated yearly, and voted by Parliament as the Civil Service Estimates. An account of the actual disbursements, audited by the Exchequer and Audit Department, is embodied in the Appropriation Account for the year, and presented with the Comptroller and Auditor-General's

Report thereon, to the Public Accounts Committee of the House of Commons. The gross total of the Civil Service Estimates for 1891–92 was £28,263,926, divided into classes, the principal of which are Public Works and Buildings, Salaries and Expenses, Law and Justice, Education, Science and Art, and the Revenue Departments. It will be interesting to observe that the gross total of the Estimates for the Army and Navy for the same year was £35,600,127.

Prior to 1855, appointments to the Civil Service were made by patronage. From 1855 to 1870 nomination was required, but candidates were also obliged to pass a qualifying examination applied by the Civil Service Commissioners, an independent body created for this purpose. In 1870 the system of open competition was established and introduced into the majority of public departments, and, in accordance with this principle, various schemes of examination and pay have been in operation. The first, in 1870, was the division of clerical appointments into Classes I. and II., partially superseded in 1876 by the Playfair scheme, which was itself afterwards abolished by successive Orders in Council. The clerical establishments are now divided into two classes, the Upper or First Division, and the Second Division. Examinations for appointments to the Upper Division, after being suspended for five years, were resumed in November, 1891, and will probably be continued at regular intervals, though vacancies occurring in the higher establishments of some departments are being filled by clerks of the Second Division. The examination is of a high educational character; the limits of age for competitors are 22 and 24; the commencing salaries vary in the different departments from £100 to £200, with promotion to higher appointments carrying maximum salaries reaching to £1,000. The examination for Second Division clerkships, though of a simpler educational character, is a searching one, and the competition for these appointments being very keen renders a high standard of proficiency necessary to candidates. The limits of age are 17 and 20; the commencing salary is now uniformly £70, rising by annual increments to £350, with exceptional promotion to the Upper Division. The hours of attendance for both classes are seven, usually from 10 to 5. Competitive examinations are also held for appointments as assistants of Excise, out-door officers of Customs, male telegraph learners, temporary boy clerks and copyists, as well as for some appointments for which previous professional or technical training is required. Printed regulations for the foregoing as well as for most other examinations are obtainable from the Secretary, Civil Service Commission, Cannon Row, S.W. Females, selected by open competition, are employed in the Post Office as clerks, sorters, and telegraphists. Female telegraph learners and sorters commence respectively at ten and twelve shillings per week; female clerks at £65 per annum. The female clerical staff at the General Post Office, London, now numbers over 900, but no other department as yet admits female clerks. Female type-writers are employed in some departments, but the appointments are not open to competition. By a decision of the Postmaster-General in November, 1891, vacancies among the rural and provincial town postmen, and among the auxiliary postmen in London, are in future to be offered in the first place to Army Reserve men and discharged soldiers.

Appointments abroad, open to competition, include the India Civil Service, India Forest Service, Student Interpreterships in China, Turkey, etc., Eastern Cadetships, and Engineer Studentships in the Royal Navy. The principal appointments for which nomination is still required, followed by limited competition, are British Museum assistants, clerks in the Foreign Office, House of Commons and House of Lords, and cadets in the Royal Irish Constabulary. Civil Service Examinations are announced by advertisement in some of the principal newspapers; they are held in London, and, for some classes of appointments, in Edinburgh, Dublin, Liverpool, Leeds, Bristol, etc., as well. After passing an examination, certificates of age, health, and character are in all cases required. All permanent Civil Servants are entitled to pensions, which are governed chiefly by the Superannuation Acts of 1859 and 1887, and the Pensions Commutation Act of 1871. After ten years' service a pension of ten-sixtieths of the annual salary is granted, and for each additional year an additional sixtieth, with the limit of a total of forty-sixtieths.

Civita Vecchia (anc. *Centum Cellæ* or *Trajani Portus*), a fortified port on the W. coast of Italy, giving its name to a province of which it is the chief town. Situated 40 miles N.W. of Rome, it affords almost the only safe anchorage on the coast, having a good harbour formed by two projecting moles and a breakwater, but no great amount of business is done. Wheat, alum, cheese, skins, staves, and bark, are the staple exports, whilst the imports consist of woven fabrics, salt and salted provisions, wine, and drugs. There is regular steam communication with most Italian ports, and consuls of various nations are established here. The town originally sprang up round a palace of Trajan, and it grew to some commercial importance. It was totally destroyed by the Saracens (812), and rebuilt under Pope Leo IV. The province has an area of 380 square miles.

Clackmannanshire, the smallest county in Scotland, comprising only 29,440 acres, is bounded S. by the river Forth and part of Perthshire, N. and E. by Perthshire and Fifeshire, and W. by Stirlingshire. It is drained by the rivers N. and S. Devon, and the soil is mostly alluvial and flat, producing heavy crops of peas, beans, corn, etc. The Ochil Hills, rising to over 2,000 feet in the N., and an elevated ridge traversing the centre, are only suited to pasturing sheep. The county is rich in minerals. Coal, iron-stone, hæmatite, copper, silver, lead, cobalt, and arsenic, are worked with profit, and sandstones and basaltic rocks are quarried. Manufactures are considerable, including woollens, shipbuilding, glass, tanning, brewing, and distilling. The chief towns are Clackmannan, Alloa, Tillicoultry, and Dollar. Jointly with Kinross the county sends one member to Parliament. The town of Clackmannan is near the point where the

Devon enters the Forth, and is little better than a village. Alloa is much the most important centre.

Cladocera, a subdivision of the PHYLLOPODA, which is itself one of the four groups included in the ENTOMOSTRACA. The Phyllopoda include those elongated, segmented Entomostraca, which have a shield-shaped or bivalve shell. The Cladocera includes those Phyllopods which are small and laterally compressed and have a bivalve shell and a pair of large, two-branched swimming feet. The most typical and best-known genus is *Daphnia*, the "water flea."

Cladode, a branch flattened in a leaf-like manner, as in *Opuntia* and some other cacti, and in the butcher-broom and its congeners (*Ruscus*).

Claim, Claimant. In administration proceedings, windings-up, and similar practice in the Chancery Division of the High Court, persons who consider themselves to have rights against the assets in course of administration must send in their claims in the shape of formal notice to the executor, liquidator, etc. In bankruptcy, a creditor must prove his debt before he can receive a dividend from the estate, but where he is unable to perfect his proof he is allowed to enter his claim *pro tanto*, and the dividends thereon will be reserved for a reasonable time to enable proof of debt to be made.

Clairaut, or CLAIRAULT, ALEXIS CLAUDE, the son of a mathematical teacher, was born in Paris in 1713, and developed so precocious a capacity for figures that at the age of 18 he was elected to the Academy of Science. In 1736 he was sent with Maupertuis to Lapland, to measure an arc of the meridian. He proposed a solution of the problem of the three bodies, which brought him into unhappy rivalry with D'Alembert, and divided mathematicians into factions. He calculated the perihelion of Halley's comet, and won the prize of the St. Petersburg Academy for his treatise on the Lunar Theory. His other works were *On the Shape of the Earth*, *The Elements of Algebra*, and *The Elements of Geometry*.

Clairvaux (*Clara Vallis*), a commune in the department of Aube, and on the river Aube. Here was built in 1115 a famous Cistercian monastery. one of the so-called *filles de Citeaux*, or daughters of the mother establishment in Burgundy. St. Bernard was the first abbot. The ruined buildings have been of late years converted into a prison or reformatory.

Clairvoyance is the power, real or supposed, which some people claim, of being able to see, while under the influence of mesmerism, events which are taking place at spots far distant from the body, and of which, under ordinary conditions, the clairvoyant could have no knowledge of. Lately clairvoyants have professed to be able to penetrate the inner consciousness of another person and read his intentions, and even forecast his future actions. But the whole theory of clairvoyance seems to have little, if any, scientific basis.

Clan, a Gaelic word signifying a tribe or sept such as has existed in the Highlands of Scotland and in Ireland, and indeed in almost all known races at an early period of their history. The clan in theory consisted of blood relations, descended from one common founder, and acknowledging one chief, who owed the clan countenance and protection in return for fealty. The devotion of clansmen to their chief and to each other was proverbial. Scott has well pictured the working of the clan principle in *Waverley*, *Rob Roy*, and other of his novels. The lands of the clan were in some measure held in common, and doubtless much of the agrarian troubles and confusions in Ireland have arisen from the conflict between the ideas of land-holding as introduced from England and those which prevailed under the old clan system.

Clapham, the name of several parishes and villages in the United Kingdom, the most important being the large parish (1,137 acres) that forms the S.W. suburb of London, and is situated in the county of Surrey, at a distance of 4 miles from St. Paul's. Around a breezy common there sprang up here in the last century a few solid and comfortable country houses, inhabited by well-to-do middle-class families. Under the influence of the Rev. H. Venn, who became vicar in 1759, and of his son John, who succeeded him, there grew up a vigorous evangelical colony that numbered among its members Wilberforce, Zachary Macaulay, W. Romaine, with other thoughtful and earnest men. Sidney Smith ridiculed them as *The Clapham Sect*, but their influence was far from contemptible. The neighbourhood has now become overcrowded with smaller tenements, and Clapham Junction has developed into one of the largest railway centres in the kingdom. Clapham and Battersea are united to form a parliamentary borough.

Clapperton, HUGH, the son of a surgeon at Annan, N.B., was born in 1788. Whilst serving as an apprentice on board a trading vessel he was impressed for the royal navy, in which he became a lieutenant, and had command of a vessel on the Canadian Lakes. He came home in 1817, and became associated with Dr. Oudney and Colonel Denham in an expedition sent out by Government to explore N. Africa. Clapperton got as far as Sakatu on the way to the Niger (1824), but the death of Oudney caused him to return. In the following year he was again sent out with Lander and others, penetrating into the interior from the Bight of Benin. He failed to get beyond Sakatu, where he died of dysentery in 1827. His *Journals* were published by Lander, who also wrote *The Records of Clapperton's Last Expedition*.

Clare, a county in S.W. Ireland, comprised within the province of Munster, and bounded N.W. by the Atlantic, S. by the Shannon and Limerick, E. by Tipperary, and N. by Galway. The area is 1,293 square miles. Much of the surface is rugged and mountainous, with rocks in the N. and bogs in the W., but along the courses of the Fergus and Shannon are strips (corcasses) of the richest alluvial soil. The coast is deeply indented, and generally rocky and precipitous. Liscannor Bay is the only

safe anchorage on the Atlantic, but the estuary of the Shannon, with its many recesses, affords great facilities for navigation. Kilrush, a port at the base of the long promontory of Loop Head, intercepts much of the trade of Limerick. The river Fergus traverses the county, and at the head of the deep bay that forms its mouth in the estuary of the Shannon stands the town of Clare, but Ennis, a little higher up the river, is the capital. Kilrush, Killaloe, and Kilkee are the only other places of importance. Grazing is more profitable than tillage, and but a small proportion of the acreage is under cultivation, the people depending much on potatoes for their food. Fishing is carried on with some success as far as the heavy Atlantic seas permit, and the Shannon supplies plenty of salmon. The soil is rich in minerals such as lead, iron, and manganese, but these are little worked. Coal, flagstones, slate, and marble are also valuable products. The only manufactures are flannels, friezes, and coarse cotton goods. The primitive name of the district was Thomond, or Tuadmin, and the present appellation is derived from Thomas de Clare, a settler in the reign of Henry III. Clare sends two members to Parliament.

Clare, Earls of. [Hollis, Fitz-Gibbon.]

Clare, John, the son of a farm labourer, was born at Helpstone, near Peterborough, in 1793. Whilst engaged in the humblest rural tasks he contrived to get a little education, but his erratic habits drove him before he was 18 to seek parish relief. In 1818 *A Sonnet to the Setting Sun* attracted the attention of a Stamford bookseller, and led to the publication in 1820 of his *Poems Descriptive of Rural Life and Scenery*, followed in the next year by his *Village Minstrel and Other Poems*. He was much patronised by local admirers, and seems to have been upset by his success, which was not, however, so great as to put him above the necessity of labour. *The Shepherd's Calendar*, which came out in 1827, fell flat, and *The Rural Muse*, appearing nine years later, proved a failure. Disappointment unhinged his mind, and for nearly five-and-twenty years he was more or less under restraint, dying in 1864 in the Northampton County Asylum, where he wrote his most touching lines beginning "I am! yet what I am who cares to know?" His works are almost forgotten, for though sweet, delicate, and pure, they lack vigour and originality.

Clare, Claire or Clara, St., the founder of the order that bears her name, was born in 1193 at Assisi of a noble family. She ran away from home at the age of 18, and placed herself under the direction of St. Francis. In 1212 she established an order of Minoresses, who conformed in dress and life to the rule of the Franciscans. She died in 1253, and was canonised two years later by Pope Alexander VI. The "Poor Clares" were introduced into England by Blanche of Navarre, and establishing themselves in Aldgate gave their name to the Minories.

Claremont, a royal residence, situated in a picturesque park near Esher, Surrey, 14½ miles S.W. of London, on the South-Western railway. In the reign of Anne the estate was acquired by Sir John Vanbrugh, but in 1768 it passed into the hands of Lord Clive, who built the existing mansion. In 1816 the Crown bought the property from Princess Charlotte and her husband, Prince Leopold, and she died there next year. It was lent to Louis Philippe on his expulsion from France, and was the scene of his death in 1850. Queen Amélie and her family continued to reside there until her decease in 1866. Queen Victoria purchased it from the Crown as her private property in 1882, to make a home for the Duke of Albany, whose widow is still in occupation.

Clarence and Avondale, Duke of. Prince Albert Victor, the eldest son of Albert Edward, Prince of Wales, and grandson of Queen Victoria, was born in 1864. Educated at Cambridge, he visited India in 1889, but died in 1892, a few months after his betrothal, the succession passing to his brother, George.

Clarendon, a name used to denote a kind of thickened type, blacker than ordinary roman type.

Clarendon, Edward Hyde, First Earl of, was born in 1609. He went to Magdalen College, Oxford, to prepare for the Church, but the death of his two elder brothers left him heir to the paternal estates, so he took to the law, entering at the Middle Temple. He lived in the best literary society of the day, counting among his friends Ben Jonson, Carew, Waller, Selden, Chillingworth, Hales, Falkland, and Laud. In 1640 he was returned to Parliament, and joined the popular party. In the Long Parliament he began as a reformer, but when episcopacy was threatened went over to the king, and in 1643 was made Chancellor of the Exchequer. After Naseby he was sent abroad in charge of the Prince of Wales, but he only accompanied him as far as Jersey, where he lived two years, and laid the foundation of his *History of the Rebellion*. He joined Charles at Dunkirk in 1648. He was despatched next year on a fruitless mission to Spain, and passed two years in that country, composing his *Animadversions on the Supremacy of the Pope*. Rejoining the Prince in 1651, for nine years he had a difficult task to play in providing for the needs of the court, and in steering his course between Presbyterians and Papists, to both of whom he was obnoxious. In 1658 he received the titular dignity of Lord Chancellor, which he retained after the Restoration, when his chief function was to restrain the intemperate desire of Cavaliers to extinguish Roundheads, and of Episcopalians to annihilate Dissenters. The Corporation Act and the Act of Uniformity brought upon him the hatred of the Presbyterians, whilst the Acts of Indemnity and Oblivion made him even more detested by the disappointed Royalists. The sale of Dunkirk and the marriage of the king with Henrietta of Portugal filled up the measure of his unpopularity. He was suspected, too, of sharing in the bribes which Charles freely accepted from France, and there was an idea that by the union of his daughter with the Duke of York he hoped to place his descendants in

the line of succession. He had rapidly been promoted to the Barony of Hyde and the Earldom of Clarendon, though the king was getting weary of his respectability, and owed him a bitter grudge for the supposed frustration of his plan for divorcing the queen and marrying Fanny Stewart. In 1667 he was summoned to surrender the Great Seal, and a few months later was impeached for high treason in the Commons. Though the Lords refused to listen to the charge, he saw that he was in a hopeless case, and fled to France. There he was threatened with expulsion, but ultimately received permission to remain, fixing his abode partly at Rouen, partly at Montpellier, and dying at the former place in 1674. His last years were spent in completing his *History* and his *Meditations on the Psalms*, and in writing his *Life*, his *Essays*, his *Survey of Hobbes's Leviathan*, and his *Short View of the State of Ireland*. Clarendon's character has been the subject of much discussion, but on the whole it must be concluded that, like Bacon, he combined high intellectual and moral gifts with incredible meanness and duplicity. Amidst all the temptations of Charles II.'s court at home and abroad he lived purely and decently. His piety was genuine, and his devotion to the Church of England and to what he conceived to be the English Constitution was unswerving. If he cherished personal ambitions, he frequently sacrificed them to public aims. He wrote masterly papers, spoke readily in debate, and was painstaking in business, but his temper was not always under control, and he lacked sympathy. Proud and cold in his relations with most men, he was abject to servility in his dealings with the king, and his conduct as regards his daughter both before and after her marriage was by his own showing inconsistent with any deep sense of honour. His literary style, though involved and prolix, is seldom obscure, and, while occasionally rising to dignity, almost invariably displays grace, humour, and quiet beauty. As a historian, he was prejudiced, but his facts are in the main correct; and his descriptions of the external characteristics of his contemporaries are peculiarly happy, though his want of sympathy prevents his penetrating below the surface. When he steps beyond politics and society he becomes vapid and common-place.

Clarendon, The Right Hon. George William Frederick Villiers, Earl of Clarendon of Clarendon, and Baron Hyde of Hindon, K.G., G.C.B., etc., was born in London in 1800, and succeeded his uncle in the peerage in 1838. The family property was not large, and at the age of sixteen the future earl had entered the public service, so that at the time of his succession he was minister at the Spanish court. A devoted Whig, and a man of intelligence and tact, he formed part of Lord Melbourne's ministry in 1840 and 1841, gave a very active support as a member of the opposition to the anti-corn law movement, and in 1846 returned to office with Lord John Russell as President of the Board of Trade. Next year he accepted the Lord-Lieutenancy of Ireland, and found himself face to face with the potato famine. His successful efforts to relieve distress, and the policy with which he administered the Encumbered Estates Act made him very popular. Then followed the Young Ireland movement, which he suppressed mercifully but vigorously, without encouraging, however, the zeal of Orange fanatics. He left Ireland in 1852 far more settled and prosperous than he had found it, but his reward was ingratitude and suspicion. In 1853 he weakly allowed himself to be drawn into the Coalition, and being Foreign Secretary under so feeble a leader as Lord Aberdeen, "drifted into the war with Russia." Though compelled to resign with his colleagues in 1855, he was recalled by Palmerston to the Foreign Office, and represented Great Britain at the Congress of Paris, where he procured the neutralisation of the Black Sea, the cession of Bessarabia, the recognition of Italy as one of the Powers, and the modification of the law of nations as regards blockades, privateers, and the right of capturing cargoes. When the Whig ministry was reconstructed in 1859 Lord John Russell claimed the direction of foreign affairs, and Lord Clarendon remained out of office until, in 1864, he rejoined Palmerston's cabinet as Chancellor of the Duchy of Lancaster. Next year, on the death of Palmerston, he went back to the Foreign Office, where he remained after Mr. Gladstone's accession to power. The negotiation of the Alabama claims was conducted by him, and he was endeavouring to avert the impending European war when he died in harness in 1870. His loss was universally lamented, for no statesman ever earned a higher reputation for unselfish generosity, persevering industry, single-minded pursuit of the public good, and graceful, yet dignified manners.

Claret, the word used in England to denote French red wines from the Bordeaux district. In France *clairet* denotes a thin light wine, and this is the idea that claret conveys to nine out of ten English people. Claret was a favourite wine in Scotland during the 17th and 18th centuries, and in England too, but it was superseded by Spanish and Portuguese wines early in the present century, though it is now in favour again.

Clarification, the term given to the process by means of which a turbid solution is rendered clear. The simplest mode of clarifying is by filtering the liquid through canvas, etc., or through sand or gravel. In many cases where fine organic matter in suspension is present, the liquid is filtered through animal charcoal, or boiled with this substance, and then filtered, as in sugar refining. Centrifugal machines, depending on the fact that if a liquid be rapidly rotated the suspended matter flies to the side of the vessel, are also sometimes employed. Mordants (q.v.), as alum, may also be used as clarifiers, which, on precipitation, carry down with them the suspended matter.

Clarinet, or Clarionet, a musical instrument usually made of wood, consisting of a mouthpiece containing a single reed by which the sound is produced. It has a compass of nearly four octaves, and its full, rich, mellow tone renders it admirably

adapted for combination with stringed instruments. Beethoven, Schubert, Mozart, and most of the other great composers have employed the clarinet with much effect in concerted pieces.

CLARINET.

Clark, SIR JAMES, born at Cullen, in Banffshire, in 1788, took the degree of M.D. at Edinburgh, and served for six years as a surgeon in the army. He then spent some time in travel, studying the effect of climates and mineral waters, and finally settling in Rome. In 1824 he was fortunate enough to be appointed physician to Prince, afterwards King, Leopold, and soon afterwards began practice in London. The Duchess of Kent took him up, and he became medical adviser to the young queen, who always regarded him with the warmest esteem, and conferred on him a baronetcy. He was elected F.R.S., and Member of the Senate of the University of London, receiving many other distinctions. He died in 1870. He wrote one or two books on climate and on the treatment of consumption.

Clark, THOMAS, was born at Ayr in 1801, and at the age of fifteen entered the counting-house of Macintosh and Co., the makers of waterproof goods. He had, however, a taste for chemistry, and after working for some years at Tennant's chemical factory, was appointed lecturer at the Glasgow Mechanics' Institute. His discovery of pyrophosphate of soda was an event of considerable scientific importance. In 1831 he took the degree of M.D., and for some time devoted himself to pharmacy. He published in the *Westminster Review* a careful inquiry into our system of weights and measures, and in 1833 was made professor of chemistry in the Marischal College, Aberdeen. Various subjects engaged his attention, but the most important of his labours resulted in the process for softening hard water, which is still in use. His health did not permit him to lecture after 1844, and he devoted his later years to the revision of the text of the Greek Testament, but his notes were never published. He died in 1867.

Clark, WILLIAM GEORGE, M.A., born in 1821, and educated at Shrewsbury school and Cambridge, became fellow and tutor, and vice-master of Trinity College, and public orator of the University. In conjunction with Mr. Aldis Wright, he brought out the Cambridge and Globe editions of Shakespeare, and was editor of the *Cambridge Essays* and the *Journal of Philology*. He took advantage of the Act of 1870 to renounce his orders in the English Church. At his death, in 1878, he left £300 a year to endow a lectureship of English Literature, a subject to which he had devoted his energies for many years.

Clark, WILLIAM TIERNEY, born at Sion House, Bristol, Somerset, in 1783, became a pupil of the elder Rennie, and in 1811 was appointed engineer to the West Middlesex Waterworks, a post which he held for over forty years. He won a name for the carrying out of iron constructions, having built the suspension bridges at Hammersmith, Shoreham, Marlow, and Bath. His greatest work was the great bridge over the Danube, connecting Pesth and Buda, and completed in 1850. He died in 1852.

Clarke, ADAM, LL.D., was born at Moybeg, in Ireland, about 1762, and, after a meagre education, was apprenticed to a linendraper. This life became distasteful to him, and by Wesley's influence he was admitted to his school at Kingswood, where he was trained for the ministry. He earned a high reputation as a preacher, and was thrice elected president of the Wesleyan conference. The great work of his life was his *Commentary on the Holy Scriptures* (1810 to 1826), a book on which he expended much labour and intelligence, having acquired several Oriental languages by way of preparation. He also wrote *Memoirs of the Wesley Family*, a *Bibliographical Dictionary*, the *Succession of Sacred Literature*, and many other volumes. He died of cholera in 1832.

Clarke, EDWARD DANIEL, LL.D., the son of a well-known traveller and clergyman, was born in 1769, and educated at Jesus College, Cambridge. He spent his early life, after graduating, in travelling abroad with Lord Berwick and other young men of family, and he thus visited the whole of Europe (including Russia and Turkey), Palestine and Egypt. Happening to be on the spot at the capitulation of Alexandria, he obtained for the English Government all the antiquarian spoils of the French *savants*, and this brought him into notice. He also collected manuscripts and objects of interest on his own account. Returning to Cambridge, he presented to the University among other treasures the colossal statue of Eleusinian Demeter that adorns the library. He got a college living, and in 1808 was appointed to the new chair of mineralogy, a science in which he laboured assiduously. His *Travels* brought him in a very large sum, and his MSS. were sold to the Bodleian Library for £1,000. His health broke down suddenly, and he died in 1822.

Clarke, HENRI JACQUES GUILLAUME, DUC DE FELTRE and COUNT D'HUNEBOURG, was born at Landrecies in 1765, his family being of Irish origin. At the outbreak of the French Revolution he was a lieutenant-colonel in the army, but in 1793 was suspended on account of his noble birth. Carnot recalled him to the War Office, and he was employed in various foreign missions. In 1796 he was sent as a sort of spy over Bonaparte's movements in Italy, but became a firm friend of the future emperor. This led to the loss of his official rank, but he came back with Bonaparte on the eighteenth Brumaire and acted as his military secretary. He fought at Ulm and Jena, and in 1807 succeeded Berthier as minister of war, remaining in office till 1814, and receiving both his titles as a reward for his services. After the fall of Napoleon he went over to the Bourbons, and again returned to the War Office, being created a marshal. He died in 1818.

Clarke, Mary Cowden, the daughter of Vincent Novello, the composer, was born in London in 1809. At the age of 19 she married Mr. Charles Cowden Clarke, a publisher and a man of culture, who had enjoyed the friendship of Keats, Lamb, Hazlitt, and Leigh Hunt, and had devoted much attention to Elizabethan literature. In conjunction with her husband, who died in 1877, Mrs. Cowden Clarke edited and annotated *Cassell's Illustrated Shakespeare*, and, amongst other volumes of lighter interest, wrote *The Girlhood of Shakespeare's Heroines*. But the great task of her life has been her *Complete Concordance to Shakespeare*, a laborious undertaking, the first edition of which appeared in 1845.

Clarke, Samuel, D.D., the son of a Norwich alderman, was born in 1675, and took his degree at Cambridge in 1691. He then became chaplain to the Bishop of Norwich (Moore), and obtained the living of Drayton. He rushed eagerly into the metaphysical and ethical controversies that passed for religion in the eighteenth century. His Boyle lectures, *A Demonstration of the Being and Attributes of God*, and *The Evidences of Natural and Revealed Religion*, brought him into correspondence with Butler. In 1706 he was given the rectory of St. Benet's, London, and appointed chaplain-in-ordinary to Queen Anne, from whom he presently received the living of St. James's, Westminster. He published in 1712 his *Scripture Doctrine of the Trinity*, a work of Arian tendencies. He engaged in a dispute with Leibnitz as to the principles of religious belief, and he attacked Collins for his denial of the freedom of the will. His last undertaking was a translation of the *Iliad* into Latin. He died in 1729.

Clarke, Rev. William Branwhite, one of the discoverers of gold in Australia, was born at East Bergholt, Suffolk, in 1798. Educated at Dedham grammar school and Jesus College, Cambridge, he took orders, and, being interested in geology, made numerous excursions on the Continent of Europe. After a severe illness he went for his health to New South Wales in 1839, where he resumed clerical work, besides carrying out wide geological surveys. He was the first to discover tin and probably cinnabar in New South Wales, though his claim to the first discovery of gold is disputed. In early life he published some volumes of poems, and he was the author of numerous geological papers. He was elected F.R.S. in 1876, and awarded the Murchison Medal of the Geological Society in 1877, the year preceding his death.

Clarke's Test, a test used for determining the hardness of water. The test is performed by adding a "standard" soap solution to a known quantity of water, and shaking until a permanent lather is formed. The quantity of solution required is an indication of the hardness of the water, which is stated in degrees, corresponding to a certain weight of calcium carbonate per gallon of water.

Clarkson, Thomas, the son of the clerical headmaster of the grammar school at Wisbech, Cambridgeshire, was born there in 1760. He was educated for the Church at St. Paul's School, London, and St. John's College, Cambridge. However, in writing a Latin prize essay (1784) on the lawfulness or otherwise of slavery, he became so engrossed in the subject that he resolved to devote his life to the work of liberation. He associated himself with Granville Sharpe and other members of the Society of Friends who had already taken up the question, and in 1787 formed a committee for the abolition of the slave trade. He spent some time in visiting various ports, and collecting information as to the traffic in flesh and blood, and enlisted Mr. Wilberforce, the member for Yorkshire, in the cause. The latter, with Pitt's sanction, brought the matter before Parliament (1789), but only after many delays and defeats was the Abolition Bill carried in 1807. Clarkson then assisted to form the African Institution to promote civilisation in Africa, and he entered upon another long struggle, which was terminated in 1833 by the Act to abolish British colonial slavery. In 1838 he received the freedom of the City of London, and in 1840 attended the anti-slavery convention at Exeter Hall. His last years were spent at his estate, Playford Hall, Suffolk, where he died in 1846.

Classics, a word derived from the Roman census-taking, and denoting things of the first class or rank. It is generally used in literature to denote either writings of a certain date in the development of a language when its literature was at its best, or to denote the writings of certain recognised writers which come up to a certain understood degree of excellence.

Classification of Plants is necessary owing to the enormous number of known forms or species and the impossibility of otherwise bearing their characters in mind, arranging collections, or treating of them in books. A classification may be *artificial*, based, that is, on some one character or set of characters, and will then serve mainly as a convenient and but slightly instructive index; or it may aim at being *natural*, taking into consideration, that is, all the characters of the plant, and endeavouring by grouping together those having the most general resemblance to reconstruct the genealogy, or to trace the blood-relationship, of the vegetable kingdom (q.v.). Of the first type of classification that known as the sexual system propounded by Carl von Linné (Linnæus) (q.v.) is the best, being based, primarily, on the stamens, their number, relative length, union, etc., and, secondarily, on the styles. The natural system, though foreshadowed by Cæsalpinus, Ray, and Linné, was first thoroughly sketched out by the Jussieus and by Auguste de Candolle. It also is based mainly upon reproductive (*i.e.* floral) structures. It must always in its very nature be of a tentative character. One of the chief difficulties which it encounters is that of distinguishing between resemblances of structure which are merely apparent, functional, or *analogous*, and those that correspond to essential identity of origin or *homology*.

Clastic Rocks, so named from the Greek *klastos*, broken, are taken by modern geologists to

include not merely those commonly called *fragmentary*, such as gravel, shingle, breccia, or conglomerate, consisting obviously of pieces once broken off some earlier rock, but also all other rocks neither crystalline nor glassy, such as fine-grained sediments and precipitates, sand, clay, and gypsum, for example, and those rocks formed of organic remains, of which chalk and other limestones and coal are well-known types.

Claude Lorraine, more correctly CLAUDE OF LORRAINE, or CLAUDE GELÉE, was born at Chamague, in Lorraine, in 1600, his parents being of the humblest class. According to one tradition he was apprenticed to a pastrycook. At the age of 12 he appears to have joined his brother John Gelée, a carver at Freiburg, and to have drawn designs for him. Later on he made his way to Rome in search of work, and worked for a time at Naples under Godfrey Waals, a landscape painter. For two years he served Tassi, another landscapist at Rome, in almost a menial capacity, but he learnt something of art, and sketched assiduously in the open air. In 1625 he made a tour, and for a year assisted Karl Dervent, painting also the ceiling of the Carmelite church at Nancy. Returning to Rome in 1627, he executed a couple of landscapes for Cardinal Bentivoglio, who secured for him the favour of Pope Urban VIII., and his fortune was then made. He not merely possessed an instinctive feeling for all the varying phases of Nature, but he studied them also from a scientific standpoint. He was laboriously painstaking in his work, never resting satisfied till he had got the desired effect. His pictures are full of light and air, the distances being marvellously represented, the colouring rich yet delicate, and the various objects harmoniously illuminated. He failed in his figures, for which he had frequently recourse to Curtois, Lauri, and other artists. He kept tinted drawings of all the pictures he sold, with the date and price of each, and these volumes, still reproduced, he named *Libri di Verità*, as giving the means of identifying his works at once. He was an etcher, too, of no mean skill. Though uneducated, he was a man of natural refinement and gentleness, beloved by his pupils, to whom he freely opened out his vast stores of practical knowledge. He died at Rome in 1682, leaving a considerable fortune.

Claudian, or CLAUDIUS CLAUDIANUS, was of Egyptian origin, and probably born at Alexandria about 365 A.D. We know nothing of his parentage, education or early life, but he tells us that his first literary attempts were made in Greek, whilst his command of Latin makes one suppose that it was his native tongue. He came to Rome in 395, and made his début with a panegyric on Olybrius and Probrius, the consuls. Between that date and 404 he produced his various complimentary poems to the Emperor Honorius, his epithalamium on the emperor's marriage with the daughter of Stilicho, his encomiums on Stilicho's victory over Alaric (*De Bello Getico*), and his consulship, together with the *Rape of Proserpine*, and the other works on which his fame rests. Through the patronage of Stilicho's wife Serena he is said to have made a wealthy marriage in Africa. He seems to have been living in 408, and in 415 or 416 he is supposed to have been dead. In him revived for a brief and final outburst the genius of classical poetry. His versification is tame and monotonous; his diction is now and then turbid and weak; his subjects are far from inspiring. Yet we can pass from Ovid, Catullus, or Propertius to Claudian without feeling absolute loss of continuity, whilst here and there flashes of real feeling and great dignity are found in his works.

Claudius, the name in Roman history of two gentes, the one patrician, the other plebeian. Some members of the former, including Cicero's famous opponent, modified the spelling to Clodius.

Claudius, APPIUS, CÆCUS, a statesman who effected some remarkable changes in the Roman constitution. Elected censor in 312 B.C. he retained office against the law for five years. He broke through caste privileges of the patricians by openly causing to be published the *legis actiones* and the *dies fasti*, thus putting the forms of procedure within reach of all. He distributed the *libertini* among the tribes, and raised Caius Flavius, a freedman, to the senate. He originated the Appian Way and the Appian Aqueduct, the first public works stamped with the name of their author. Though victorious in Samnium as consul in 296 B.C., he had no military reputation. He was, however, a keen patriot, and stirred his countrymen to reject the overtures for peace made by Pyrrhus through Cineas. He was the earliest of Roman writers. A few works of his poetical fragments still exist, but his *Sententiæ* have altogether vanished.

Claudius, APPIUS, CRASSUS, notorious for the hatred which his patrician pride provoked amongst the plebs, was consul and decemvir in 451 B.C. In the latter capacity he appears to have endeavoured to usurp permanent power, but his sudden fall was brought about by a celebrated incident of doubtful historical authenticity, commemorated in Macaulay's *Lays of Ancient Rome*. Having become enamoured of Virginia, a plebeian damsel, whose father, Virginius, was on military service, Claudius caused one of his clients to claim her as being really the child of his slave. Claudius, of course, gave judgment in his favour, but Virginius, who had been summoned back from the army, to protect his daughter from shame seized a knife from a butcher's stall and stabbed her to the heart. His act was followed by a popular rising, the decemvirs were overthrown, and Appius died in prison.

Claudius, MARCUS AURELIUS GOTHICUS, was an Illyrian by race. He served with courage and ability under Decius and Valerian, defeating the Goths, Scythians, and Heruli on the northern frontiers. Called to Rome by Gallienus to oppose the Dacian pretender, Aureolus, he was chosen emperor in 268. During his brief reign (he died in 270) he seems to have given proof of many popular virtues.

Claudius, or TIBERIUS CLAUDIUS DRUSUS NERO GERMANICUS, the son of Drusus and Antonia, and grandson of Livia, was born at Lyons in 10 B.C. Afflicted from his childhood with lameness and defective speech, he was brought up in seclusion

and neglect, devoting himself to literary studies. Caligula promoted him to the consulship, and after the murder of that emperor he was clothed by the Prætorians with the purple (A.D. 41). Personally he displayed an honourable ambition to fulfil the duties of the position. He built the Claudian aqueduct, made the harbour at Ostia, took an active interest in the administration of justice, headed an expedition to Britain, and admitted the Gauls to the higher offices of state. His interests were scholarly—though Suetonius says he always selected the most futile of subjects, such as Who was Hecuba's grandmother? and What language the sirens spoke, and he tried to add three letters to the alphabet. But he was weak enough to yield to the influence of his wives and favourites. He married four times. Messalina, his third consort, was put to death after a career of shameless vice for going through a form of marriage with one of her lovers. The freedmen, Narcissus, Pallas, and Polybius, in turn swayed the counsels of their master, who was wrapped up in the composition of historical works, none of which survive. His last wife, Agrippina, having induced him to set aside his own heir Britannicus in favour of her son Nero, poisoned her husband in 54 A.D. in order to prevent his altering his mind.

Clausel, or CLAUZEL, BERTRAND, was born at Mirepoix in 1772. His father was a supporter of the Revolution, and the son, entering the army in 1791, fought with distinction in the early campaigns, and in 1799 was a general of brigade. He ably assisted Napoleon in the Austrian campaign of 1809, and in 1810 received a command in Spain. He besieged Ciudad Rodrigo, and lost the hardly-contested battle of Salamanca, where he was severely wounded, but he conducted a masterly retreat of his army. In the Hundred Days he rejoined Napoleon, and was exiled on the restoration of the Bourbons. He passed several years in America, but in 1830 received the chief command in Algeria, being created marshal in 1831. Though not very successful in his policy, he was sent back to Algeria as governor in 1835. For his failure to take Constantine he was finally recalled two years later, and died in 1842.

Clausewitz, KARL VON, was born at Burg in Prussian Saxony in 1780. He entered the service of Russia in 1812, and took part in the memorable campaign against Napoleon, an account of which he published in 1814. Appointed four years later director of the "war school" of Prussia, he held that post till his death in 1831. Among his many posthumous works his treatise *On War* has enjoyed a high reputation.

Clausius, RUDOLF JULIUS EMMANUEL, was born at Köslin in Pomerania in 1822. Educated at the university of Berlin, he became professor of physics at the artillery school, until in 1855 he was called to a chair in the university of Zurich. Ten years later he received a similar appointment at Wurzburg, whence he passed to Bonn, where he died in 1888. His early scientific labours were devoted to optics, electricity, and the elasticity of bodies, but the great task of his life was the investigation of the real nature of heat, and the application of mathematical methods to thermodynamics, electricity, and the expansion of gases. His chief works are *Die Mechanische Wärmethevrie*, and *Die Mechanische Behandlung der Electrizität*. He also wrote treatises on mechanical physics and on the nature of heat, and a valuable essay entitled *Das Potential-Function und das Potential*.

Clavaria, a genus of fungi belonging to the *Hymenomycetes* (q.v.) and giving its name to the family *Clavariæ*. They have tapering rod-like or coralloid branching bodies, generally white, pink, or yellow; grow among leaves, on rotten wood or in moist grass; and have spores over almost all their surface. *C. vermicularis*, on lawns, resembles a small bunch of white candles, and, like many other kinds, is edible.

Claverhouse, JOHN GRAHAM OF, VISCOUNT DUNDEE, was born in 1643, being the son of Sir William Graham of Claverhouse, remotely connected with the Montrose family. After being educated at St. Andrew's, he served in the French and Dutch armies. He returned in 1677 and was put by Charles II. in command of a troop of horse with orders to suppress the Covenanters in the West of Scotland. Defeated at Drumclog (1679), he fled to Edinburgh, but returned with Monmouth to take vengeance on his foes at the battle of Bothwell Bridge. By his cruelty, rapacity, and vigour he earned high rewards from the king, and bitter hatred from the people. In 1688 he was raised to the peerage. He failed to stimulate James II. to offer resistance to the Stadtholder, and after the revolution of 1688 gave his professed allegiance to William. However, no sooner had he been sent to Scotland than he began Jacobite intrigues, and succeeded in raising a large force with which he took up a position at Killiecrankie to meet the forces of General Mackay who was despatched to quell the rising. Here he was totally defeated (July 27, 1689), and perished in the fray. He was buried in the church at Blair Athol, but his grave has long since disappeared. The Jacobite partisans endeavoured to throw a halo of romance about his memory, but beyond courage and some slight military ability he had little to recommend him.

Clavicle, or COLLAR BONE. Fracture of this bone is not uncommon as the result of a fall on the shoulder or hand. The collar-bone, forming the only direct bony connection of the upper extremity with the trunk, is exposed to especial danger under such conditions. The two ends of the bone readily unite, though there is often some disfigurement, the parts being so difficult to keep in apposition. Dislocation of the clavicle is a rare form of injury.

Clavigero, FRANCESCO SAVERIO, was born at Vera Cruz in 1720. He spent thirty-five years in Mexico chiefly as a Jesuit missionary, and collected a vast amount of historical and antiquarian information. On the suppression of the Order there in 1767 he came to Europe, and settling at Cesena in

Italy, compiled his *Storia Antica del Messico*, which was published in 1780. He died in 1793.

Claws, a popular name for the chelæ of the crab, lobster, etc., more properly applied to the epidermic tips of the digits in the lower vertebrates, corresponding to the nails in man. These may be weapons of offence, as in the cats; digging instrument, as in the armadillo; or means of support, as in bats and sloths.

Clay, an earthy hydrous silicate of aluminium. It is very fine-grained, and absorbs large quantities of water, which it holds interstitially. This renders it plastic, or capable of being moulded into and retaining any shape, and also makes it impermeable to additional water. It thus forms a tenacious soil, holding wet on its surface, and is known to farmers as "cold," since much of the sun's heat that falls on it will be absorbed in evaporating the water. When gradually dried, clay falls to an impalpable dust; but when burnt it undergoes partial fusion into the most imperishable substances, porcelain, earthenware, pottery, and brick. Clays seem always to have resulted from the chemical decomposition of felspathic matter [FELSPAR], but may be deposited by either fresh or salt water, and may result from the decay of volcanic pumice, etc., or as an insoluble residue after the removal of calcium carbonate from limestones (at least mainly) organic. *Kaolin* (q.v.) is a very pure clay, free from iron or alkali, used for china, resulting especially from the decay of the felspar in granite. Pipe-clay, as in the Eocene rocks of Corfe, Alum Bay, and Bovey Tracy, is a similar white clay which shrinks too much for pottery. Fire-clay, also free from iron and alkali, as in the beds below coal-seams known as "seat," or "bottom," clay, contains free silica and resists intense heat without melting. Most clays contain potash, iron-oxides, and some magnesia, the iron-salt colouring them blue before exposure to air, then brown (on its hydration), and the familiar red of brick, when burnt. Clays belong to almost all geological periods; but those of the older series are mostly compressed into slates or shales. Among the most important clays are the Lias, Oxford, Kimmeridge, Gault, and London clays, all marine and at first blue; the Weald clay, blue and fresh-water; the Plastic, Mottled, or Woolwich and Reading clay, estuarine; the Boulder-clay, with fragments of other rocks, of glacial origin, often chalky and almost white; the brown "Clay with flints," the soil resulting from the surface decay of the Chalk; the *terra rossa*, or similar red-brown earth on other flintless limestones; and the red cave-earth, formed similarly within caverns. In no rocks are fossils more delicately preserved than in clays.

Clay, CASSIUS MARCELLUS, the son of a well-known pioneer, General Green Clay, was born in Kentucky in 1810, and was a member of the Kentucky Legislature, where he spoke in favour of Abolition, and against the annexation of Texas. He edited *The True American*, an abolitionist paper, and incurred unpopularity and even danger by his opposition to slavery. In 1846–7 he served with distinction in Mexico. Lincoln, whom he supported, made him minister to Russia in 1863. He was recalled in 1869, and died soon afterwards. Horace Greeley edited and published his writings and speeches.

Clay, HENRY, the son of a Baptist minister in Virginia, U.S.A., was born in 1777. Left an orphan very early, he obtained a legal education after much difficulty, and soon won a large practice by his oratorical powers. He took an active interest in politics, urging the partial abolition of slavery in 1799, though later on he assented to the Missouri Compromise, and as late as 1850 supported the discretional retention of slavery in the territories acquired from Mexico. In 1803 he entered the Kentucky Legislature, of which he became speaker in 1808, fighting rather a memorable duel in that year. In 1811 he was returned to Congress, and became speaker. His energies were devoted chiefly to forcing on the war with England, and he assisted in 1814 in concluding the Treaty of Ghent, by which that brief struggle was terminated. In 1824 he was nominated for the Presidency, but transferred his votes to Adams, whose election was thus secured, Clay becoming Secretary of State. It was on this occasion that he fought his famous duel with John Randolph. He thrice contested the Presidency in after years, but was defeated. One of his chief political aims was the liberation of America from European control. Though he wavered at times, he was on the whole a Protectionist. After a brief withdrawal from public affairs he came back to the senate in 1848, and carried in 1850 his Omnibus Bill to avert the disruption of the States on the slavery question. He died in 1852.

Clay Iron Stone, an impure carbonate of iron, containing considerable quantities of clay, which is largely employed for the production of iron; the greater quantity of the metal smelted in England being obtained from this ore. It is of a light to dark-brown colour, sometimes black owing to carbonaceous matter (black band), and occurs largely in the clay and shales of the coal measures.

Claymore, a compound Gaelic word from a word cognate to Lat. *gladius*, and English *glaive*, and the epithet *mor*, great (cf. MacCallum More, Dugald Mohr, Arranmore). The name was first applied to the great two-handed Scottish sword, such as Lindsay is described in *The Monastery* as carrying on his celebrated visit to Queen Mary at Loch Leven—a sword so long as to be carried on the back, and drawn from over the shoulder—an apparently impossible feat. Later the name came to be applied to the basket-hilted broadsword, which formed part of the equipment of a Highland gentleman, and is still carried by the officers of a Highland regiment. The cry of "Claymore" had the same significance for a Highlander as the cry of "Clubs" for a London apprentice of the olden time. Many an Andrea Ferrara blade became a Claymore.

Clayton, JOHN MIDDLETON, was born in Delaware, U.S.A., in 1796. Graduating at Yale College, he practised the law with success. In 1829 he was elected senator, and sat in Congress for seven years, when he was appointed chief justice of his native state. Returned again to Congress in 1845, he became Secretary of State in Taylor's presidency, and concluded the "Clayton-Bulwer Treaty" (1850) to settle matters in dispute between England and the United States as to Central America. He retired from office that year, but remained in the senate until his death in 1856.

Clayton, ROBERT, born in Dublin in 1695, became Bishop of Killala in 1729, and was translated to Cork in 1735, and to Clogher in 1745. He wrote several learned books on theological subjects, but was chiefly remarkable for his *Vindication and Defence of the Histories of the Old and New Testament*, in which he assailed the scepticism of Bolingbroke. His own orthodoxy was, however, very questionable, for he moved in the House of Lords that the Nicene and Athanasian Creeds should be expunged from the Liturgy. The peers directed that he should be prosecuted for heresy, but he died in 1758 on the eve of his trial.

Cleanthes, nicknamed "The Ass," from his slow patience, was born at Assos about 300 B.C. A pugilist by profession, he went to Athens and there heard the discourses of Crates the Cynic, and Zeno the Stoic. He now devoted himself to philosophy, supporting himself by manual labour, and was so successful that on Zeno's death (263) he became the head of the school. Chrysippus, and Antigonus, king of Macedon, were among his disciples. He does not appear to have possessed much originality, and very little can be gleaned from the few fragments of his fifty works that are scattered about the pages of other writers. His *Hymn to Zeus* indicates some grandeur of thought and language, and was quoted by St. Paul in his speech at Athens. He died about 220 B.C. from voluntary starvation. His doctor had ordered him to fast for two days, and when he had got so far on the way to death he thought it was not worth while retracing his steps.

Clearing-house, a word used in connection with banks and also with railways to denote a central office where the respective claims of different banks or railways, as the case may be, are entered, compared and adjusted, the banks paying or receiving the balance. The object of the institution is to save the labour which would be caused to a bank or railway by the continual running backwards and forwards which their fluctuating relations would otherwise require. And the same cause holds good in the case of railways that run over each other's lines and use each other's rolling or other stock, and whose mutual claims and obligations become greatly complicated. A certain bank A may during a day accumulate various claims amounting, say, to £50,000 upon the bank B. During the same period the bank B may accumulate claims upon A to the amount of £56,000. These claims are all sent into the clearing-house, and at the end of the day, or other agreed period, B will receive its balance of £6,000. The business transacted by the London clearing-house is gigantic, and enormous sums are dealt with. Besides the ordinary daily clearances there are special ones, such as the 4th of each month, the Consols settling day, and Stock Exchange settling day, and the transactions of some of these settling days have an importance as showing the general condition of the financial world.

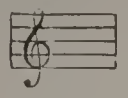
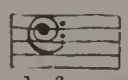
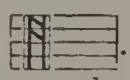
Clearing Nut, the one seed in the fruit of *Strychnos potatorum*, a tree native to the forests of India, used in that country to purify turbid water by being simply rubbed round the inside of the drinking-vessel. This action depends apparently on the albumen and casein which the seed contains acting as a fining agent like the isinglass dissolved in acid employed in fining beer.

Clearwings, a group of moths of the family *Sesiidæ*, of which we have about thirteen British species. They fly mainly in bright sunshine; they are exceptional in some other ways; thus their wings are clear and transparent, and many species externally resemble gnats and bees.

Cleator Moor, a town in W. Cumberland, on the river Eden, 4 miles S.E. of Whitehaven, and with a station on the London and North-Western Railway. It is in the centre of a coal and iron field, and has smelting furnaces where hæmatite iron of the best quality is largely manufactured.

Cleavage, SLATY, the division of a rock into layers capable of being indefinitely subdivided, having the same mineral composition, mostly made up of non-crystalline particles, and differing altogether in direction from the planes of bedding or stratification. Cleavage occurs notably in argillaceous rocks, which are known as *clay-slates*, and belong either to the older geological formations, Cambrian, Ordovian, or Silurian, or are in the neighbourhood of intrusive igneous rocks or other disturbed district. The "strike" of the cleavage-planes, or their direction across the country as laid down on the map, generally remains parallel over wide areas, coinciding with that of the principal folds in the crumpled rocks. Their "dip" or inclination to the horizon is generally either vertical or nearly so, thus cutting crumpled bedding-planes at various angles. Fossils are distorted along the faces of the cleavage-planes, and pebbles often cut through by them. Microscopic examination shows the rock-particles arranged with their longer axes parallel to the planes, thus giving a "grain" to the rock, and obviously compressed. Scales of mica and small garnets are common in slates. These characters and experiments with hydraulic pressure upon wax, clay, etc., made by Tyndall, Sorby, and others, show slaty cleavage to be the result of tangential (horizontal) pressure. It must not be confused with *crystalline clearage*, the splitting up of a crystal into smaller crystals. [CRYSTAL.]

Clef, in *Music*, a character placed at the beginning of a stave, to indicate the pitch and

names of the notes on that stave. The number of clefs in common use is three, viz.: the Treble or G-clef, represented thus,  ; the Bass or F-clef,  ; and the Tenor or C-clef,  . Other clefs which were formerly in use are the Soprano, the Alto, and the Gregorian clefs.

Clematis, a genus of shrubs belonging to the order *Ranunculaceæ*, comprising about 100 species. They usually climb by twisting the stalks of their opposite leaves round a support. They are also exceptional in the order in the leaves being usually pinnately compound, in having a petaloid calyx of four valvate sepals, but no petals, and in the long feathery tails or awns of each of the achenes in their fruits. From this last character the only British species, *C. Vitalba*, the traveller's-joy, gets the name old man's beard. Several species are grown in gardens besides various hybrids, of which the large purple *C. Jackmanni* is the type.

Clemens, SAMUEL LANGHORNE, better known by his *nom-de-plume* of "Mark Twain," was born in Missouri in 1835. He began life in a printing office, but engaged in a variety of pursuits, among them that of a steamboat pilot on the Mississippi. He also won popularity as a reporter for Californian papers, and as a humorous lecturer. In 1867 he published *The Jumping Frog*, and set out on a tour in the Old World, which he described in *The Innocents Abroad*. He married a lady of fortune, settled at Buffalo for some time as editor, and in 1884 established the publishing house of Webster and Co. at New York. Among his most successful books are *Roughing It*, *Tom Sawyer*, *A Tramp Abroad*, and *The Prince and the Pauper*. He has also attempted dramatic composition in *The Gilded Age*, a comedy of some merit. His only serious undertaking has been the compilation of *General Grant's Memoirs*. Mark Twain's writings have fostered the taste for the dry and somewhat monotonous humour, supposed to be a product of Western civilisation, but his literary ability has been rather cramped by the form in which it is expressed.

Clemens Alexandrinus, one of the most interesting of the Greek Fathers of the Church, has left but slight traces of his personal history. Eusebius and Photius call him Titus Flavius Clemens "the Alexandrian," but whether he was a native of Egypt or a settler cannot be ascertained. From the internal evidence of his writings we may infer that he flourished in the reign of Severus, about the beginning of the third century, and he appears to have been a disciple of Pantænus, and a teacher of Origen and of Alexander, Bishop of Jerusalem. His minute acquaintance with pagan rites suggests that he was converted in manhood. He appears to have visited Antioch, and it is conjectured that he spent some or all of his later years at Jerusalem. Four of his works have come down to us complete, viz. *A Hortatory Address to Greeks*, *The Pædagogue*, *Stromatis or Stromata*, and *Who is the Rich Man that is Saved?* The first of these is a most elaborate protest against the absurdity and immorality of Greek theology, as contrasted with that of the Christian Church; the second is a practical exposition of Christian duty in the various circumstances of life; the third consists of miscellaneous disquisitions on all sorts of literary and philosophical topics, with a view to explaining the Christian point of view; whilst the last is a sermon on St. Mark's Gospel x. 17–31. Half a dozen other books are known to us only by name, and through fragmentary paraphrases. Chief among them are the *Hypotyposes* or *Adumbrations*, and the Ecclesiastical Canon. Clemens is a valuable author, because he shows us the process by which Christianity and Gnosticism gradually became fused, so as to produce the body of doctrine upon which the churches rest. He was a widely-read scholar, to whom nearly all classical literature was no less familiar than the Hebrew Scriptures and the majority of the books that make up our New Testament. His writings thus preserve many fragments of books otherwise unknown. But though learned, he is not polished, and his style is vigorous rather than graceful.

Clemens Romanus. [CLEMENT I.]

Clement, the name of fourteen occupants of the Papal chair.

Clement I., one of the Apostolic Fathers, is said to have been bishop of Rome from 91 to 100 A.D. Nothing trustworthy is known of his life, but his Epistle to the Church of Corinth is still extant and possesses considerable merit, besides containing some of the earliest references to the canonical books of the New Testament.

Clement VII. (GIULIO DE' MEDICI) was a cousin of Leo X., and was elected pope in 1523, having previously been Archbishop of Florence and Cardinal. He allied himself with Francis I. of France and the Republic of Venice against the Emperor Charles V., with the result that the Imperialists under the Constable of Bourbon sacked Rome in 1527. He resisted the divorce scheme of Henry VIII. of England and in 1534 issued his famous bull against that monarch, dying in the same year.

Clement XI. (GIAN FRANCESCO ALBANI) was born at Pesaro in 1649, and succeeded Innocent XII. in the papacy in 1700. In consequence of his attitude towards Austria the states of the Church were occupied by Imperial troops in 1707. He took up a strongly aggressive position towards the Jansenists, who were gaining head in France, issuing first the bull *Vineam Domini*, and subsequently that known as *Unigenitus*, the latter being specially directed against the work of Père Quesnel, which had secured the approval of the Archbishop of Paris. In 1715 he supported the Pretender in his claim to the English throne, and gave him hospitality at Rome. His learning was considerable, and he patronised the arts liberally. He died in 1721.

Clement, JACQUES, was born at Sorbonne in 1566, and entered the Dominican order. When Henry III. was besieging the Catholic League in Paris, he conceived the idea of assassinating the king, and his fanaticism was encouraged by the Duke of Mayenne. On August 1, 1589, he obtained admission to the palace on pretence of handing a letter to Henry, whom he stabbed to the heart, being cut down himself on the spot by the royal attendants.

Clementi, MUZIO, was born at Rome in 1752. He showed a precocious talent for music, and at the age of nine was so proficient in theory and practice that he was appointed organist at a church, and five years later wrote a promising mass. Beckford, the author of *Vathek*, induced him to come to England, where in 1770 he made his first public appearance with great success. In 1777 he became conductor of the Italian Opera, but soon after went to Paris and Vienna, where his reception was enthusiastic. In the latter city he engaged in a kind of musical contest with Mozart, coming out of the ordeal with high credit. Returning to London, he spent twelve years as a teacher, performer, and manufacturer of pianos. With John Field, one of his ablest pupils, he undertook a long continental tour in 1804, giving advice and instruction to Meyerbeer at Berlin. He came back to England in 1810, but refused to play any more in public devoting himself to composition. He has been justly regarded as the founder of modern pianoforte playing. His skill was remarkable even in his later days, and his great collection of *Études*, known as the *Gradus ad Parnassum*, still remains one of the most valuable works of instruction. He left also about sixty sonatas for his favourite instrument. His death occurred at Evesham in 1832.

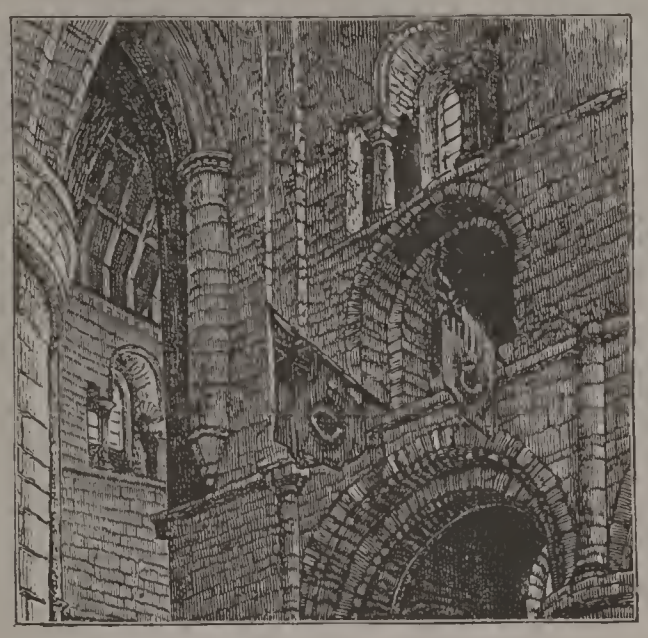
Cleomedes, a Greek astronomer as to whose life and era nothing certain is known, but he cannot have flourished before the close of the first century B.C. He wrote a very remarkable treatise on *The Circular Theory of the Heavenly Bodies*, in which many later discoveries are anticipated, such as the sphericity of the earth, the refraction of light, and the central position of the sun in the solar system.

Cleon, the son of an Athenian tanner named Cleænetus, obtained by his coarse but powerful eloquence and by demagogic arts a considerable hold over his fellow-citizens. He began by opposing the war policy of Pericles, but we afterwards find him combating with equal ardour the pacific counsels of Nicias. In 427, when at the zenith of his power, he persuaded the assembly to condemn the male population of Mitylene to slaughter, a decree rescinded on the following day. In 425 he boasted that he would reduce the island of Sphacteria, long blockaded ineffectually by Nicias, and bring the garrison in chains to Athens within twenty days. He received the command, and fulfilled his promise. Three years later he was sent to recover Amphipolis in Thrace, but he was defeated by Brasidas, both commanders being slain in the action. Cleon was naturally an object of detestation to the oligarchical aristocracy of Athens, and as we get our information of his character and policy solely from Thucydides and Aristophanes, who not only belonged to that party but were also personally at variance with the democratic leader, it is probable that history has hardly done him justice. He is generally regarded as the type of a vulgar, loud-voiced, shifty, unscrupulous agitator, trading on the worse passions of an ignorant mob. But he must have possessed vigour and ability, even if they were combined with less estimable qualities.

Cleopatra, the name of several Ptolemæan princesses of Egypt, the most famous of them being the daughter of Ptolemy Auletes, born in 69 B.C. Her father dying when she was seventeen left the kingdom to her conjointly with her brother Ptolemy, whose wife she was to become according to the custom of the country. She was, however, excluded from her share, until Julius Cæsar, fascinated by her beauty, took up her quarrel, defeated and slew Ptolemy, and replaced her on the throne. She followed her lover to Rome and lived with him there, to the no little scandal of the citizens, until his assassination. On her return to Egypt she resolved to ensnare Antony, with whom she had already been acquainted in his earlier days. With that intention she went in full regal pomp to meet him in Cilicia, and so completely beguiled the ambitious Roman that he abandoned his great career to sink himself in sensual ease by the banks of the Nile. [ANTONY.] For a brief period he shook off the fatal spell, married Octavia, and entered again into politics. But his infatuation was soon renewed, and Augustus made the wrong done to his sister a pretext for war. In the battle of Actium (32 B.C.) the fleet of Antony and Cleopatra was hopelessly defeated, and the pair fled to Alexandria. When it became evident that Antony's cause could never be revived, Cleopatra is said to have undertaken to compass his death. She proposed that they should both simultaneously commit suicide. Antony destroyed himself in the belief that she had already done so. Possibly she hoped to beguile Augustus as she had beguiled his predecessors, but in this she was disappointed. He resisted her blandishments and purposed to carry her a prisoner to Rome. Rather than suffer such a disgrace she exposed her bosom to the bite of an asp, and perished in the 39th year of her age. She was a woman of considerable intellectual ability. With her the dynasty of the Ptolemies ended. It is believed that she had three children by Antony, and perhaps one by Cæsar.

Clepsydra, a compound Greek word from *kleptein* (to hide), and *hudor* (water), denoting a water-clock. Originally the instrument was simply a vessel containing water which was allowed to escape from a small orifice at a uniform rate, and whose sinking marked in a uniform manner the passage of time. An improvement on this provided a float which either marked the time by its sinking, or by compensatory action caused a balancing weight to rise and mark the time upon a graduated scale on the outside of the clock. Later the use of a dial and needle was introduced. Athens possessed an intermittent fountain somewhat of the nature of a water-clock.

Clerestory (more properly *clearstory*), a term used in architecture, and especially in ecclesiastical architecture, to denote an upper storey with



CLERESTORY, CARLISLE CATHEDRAL.

windows by which the centre of a building is lighted. In some churches the clerestory rises immediately above the aisles, in others the *triforium*, called also the blind-storey, from the fact of its having no windows, comes between.

Clergy, a word used to denote those primarily who are in holy orders, and then extended to embrace all who officiate as ministers or pastors in a place of worship. From the claims of ecclesiastical persons to exemption from the jurisdiction of the ordinary courts of law, and from the further fact that in the Middle Ages the being able to read was almost proof of being an ecclesiastic, sprang the curious English practice of pleading *Benefit of Clergy* (q.v.). Readers of Kingsley's *Hereward the Wake* will remember how Martin's reluctant admission to Prior Brand put him in some danger of being looked on and dealt with as a runaway monk. The Russian Church divides its clergy into the Black and the White, the former name being bestowed upon the monastic orders and the latter upon the secular clergy. The correlative word to the "clergy" is the "laity," and just as this latter word is still often used to denote non-professional men both by physicians and lawyers, so formerly "clergy" was used to denote any one learned or belonging to a learned profession. But to most people the word carries the implication of one who has received episcopal ordination.

Clerk, like clergy, formerly denoted a learned person of any description, and has been so used in modern times. For instance, Coleridge tells us, with somewhat of tautology, how "the devil quoted Genesis like a very learned clerk." And in legal language a clergyman is styled "a clerk in holy orders," thus implying that the two terms are not synonymous. From denoting the ordained clergy, or those who were connected generally with the service of the church, the word came to be applied to the second of the two, who in the last century and the early part of the present performed the duet which made up the greater part of the services of the English Church, the first of the two being the incumbent. The transition of the meaning of the word from *ecclesiastic* to the sense of *general secretary* is natural, and the application of the name to assistants of all kinds has brought it about that the original sense has become almost obsolete. We find allusions to thieves as clerks of St. Nicolas.

Clerk OF THE CROWN, CLERK OF THE HOUSE OF COMMONS, CLERK OF INDICTMENTS, CLERK OF THE PARLIAMENTS, CLERK OF THE PATENTS, CLERK OF THE PEACE, CLERK OF RECORDS AND WRITS. [See the several special titles.]

Clerk, JOHN, the son of Sir John Clerk of Penicuick, in Scotland, was born at Eldin about 1730. Though he never went to sea, he took a keen interest in nautical affairs, and wrote an essay *On Naval Tactics, Systematical and Historical*, with plates. In this work he suggested the operation of "breaking the line," adopted first by Rodney with such remarkable success in his victory over De Grasse in the West Indies (1782), and afterwards repeated on many occasions by Howe, Nelson, and other admirals. It has, however, been claimed for Rodney that he invented the manœuvre independently, never having had any communication with Clerk or seen his book. Clerk died in 1812.

Clerk of Assize is the officer responsible for the due performance of the administrative duties of the Courts of Assize on each circuit. He performs the same duties on circuit which the associates formerly, and now the masters, perform at the Nisi Prius sittings in London, and he also acts as Clerk to the Crown on circuits, by which apparently is meant that he performs similar functions when the Courts of Assize are sitting for criminal business. On several circuits, however, the Clerk of Assize rarely attends the court, his functions being wholly or partially performed by his deputy, who also acts as Clerk of Assize or Clerk of Indictments on the same circuit.

Clerkenwell, a district and outlying parish of the City of London, comprised within the Metropolitan borough of Finsbury. Situated on the east bank of the Fleet, it derived its name from one of the springs that fed the stream. The *Fons Clericorum* was marked until recent years by a pump. The Priory of St. John, the chief abode in England of the Knights Hospitallers, was founded here in 1100, but the gate that now exists, and belongs to the modern representatives of the order, dates only from 1504. It is a fine specimen of the Perpendicular style. Here Dr. Johnson used to write for Cave, the founder of *The Gentleman's Magazine*, and in a kind of museum on the upper floor his chair and other relics are preserved. At the end of the sixteenth century the neighbourhood contained many aristocratic residences, as is testified by the names of several of the streets. It acquired later on a very evil reputation, more especially that portion of it known as "Hockley in the Hole," a haunt of thieves until late in the present century. The modern Sessions House

occupies the site of Hick's Hall, an older judicial building within which Lord William Russell was tried and condemned. The House of Detention, formerly in the neighbourhood, is memorable for the attempt made by the Fenians to blow down its wall in 1867. The church of St. James (1788–92) stands on part of the ground occupied since 1100 by a Benedictine nunnery, of which several interesting memorials are still preserved. For many generations Clerkenwell has been the chief centre of watchmaking and jewellery manufacture. Most of the practical work of these trades in London is done here.

Clermont-Ferrand, the capital of the department of Puy-de-Dôme, France, is situated at the foot of the volcanic mountains, of which the peak of Puy-de-Dôme is the centre, and between the rivers Bedal and Allier. The town of Clermont proper is connected with that of Montferrand by a long avenue of trees. Owing to the dark basaltic stone used for building purposes the narrow, crooked streets are somewhat gloomy. The cathedral, dating from the 13th century, is a fine but incomplete specimen of Gothic architecture. The church of Nôtre-Dame-du-Port is still older, parts of it going back to 870. The town possesses a university academy, a fine library, museums of natural history and antiquities, good public squares, and monuments to Pascal and Dessaix, who with Gregory of Tours were natives of the place. In the suburb of St. Allyre there is a curious petrifying spring. The chief manufactures are woollen and linen fabrics, silk stockings, cutlery and jewellery. A large trade in agricultural products is done in the markets. Clermont was the chief town of the Arverni in Roman times, and throughout the Middle Ages retained considerable importance, having been the scene of seven ecclesiastical councils.

Cleveland. 1. A district of the North Riding of Yorkshire, between Whitby and the Tees, for the most part a wild hilly district, rising in the south to a height varying from thirteen to nineteen hundred feet, and intersected by fertile valleys. Charles II. gave the title of Duchess of Cleveland to Barbara Villiers, and her son became Duke. The title was bestowed in 1833 upon the Earl of Darlington, one of the Vane family; and in 1891 it again became extinct, by the death of the Duke of Cleveland, his heir taking only the Barony of Barnard. The discovery of ironstone has done much of late years to develop Cleveland.

2. A lake-port situated upon the S. shore of Lake Erie, and at the mouth of the Cuyahoga river in the United States of America. It is the second city of the State of Ohio, ranking next after Cincinnati, and is in lat. 41° 30′ N. and long. 81° 47′ W., 255 miles N.E. of Cincinnati, 183 S.W. of Buffalo, and 350 E. of Chicago. The city is upon a plain overlooking Lake Erie, and is cut in two by the stream and valley of the Cuyahoga, which is crossed by several bridges, among which are two viaducts, one 3,211 ft. in length and the other 3,931 ft. The river forms the inner harbour, and on the flats alongside are numerous factories, mills, coal-yards, timber-yards, and docks. The outer harbour is protected by a breakwater at a distance of half a mile from the shore, and having a length of two miles. The town is laid out in regular, wide streets, with plenty of trees, especially maple, which abound to such an extent as to have gained for Cleveland the name of "the Forest City." Among the public buildings—many of them imposing—are 150 churches, ten theatres, and eight colleges, besides seven hospitals and two large libraries, one of which is free. The climate is temperate, and there is a good water supply from Lake Erie. The public square, or Monumental Park, contains 10 acres, and from it a beautiful avenue, bearing the somewhat dry name of Euclid Avenue, leads east for 4½ miles to Wade Park of 65 acres, with forest trees, lake, fountains, and deer park. In Lake View Cemetery is an imposing monument to President Garfield. By its lake traffic, which amounts to 3,000,000 tons, and by the Ohio canal, and its seven railway termini, Cleveland has become a very great mercantile centre, being the chief outlet for the iron ore, coal, limestone, and lumber in which the neighbourhood abounds. The industries of the city are many, the chief among them being iron and steel works of every description, including the building of steamships of considerable dimensions; and much petroleum is refined in the town.

Cleveland, Grover (born 1837), is the son of a Presbyterian minister of New Jersey. He was educated for the bar, to which he was called in 1859. In 1870 he became sheriff of Erie county. In 1882 he was governor of New York, and in 1885 was elected President in the Democratic interest. But his supposed leaning to Free-trade caused some dissatisfaction, and probably led to his defeat by General Harrison in 1888. One of his latest acts was to demand the recall of the British representative at Washington—Lord Sackville—upon the ground of interference with internal politics.

Cleveland, John (1613–1658), an English poet, born at Loughborough in Leicestershire, the son of a clergyman who was deprived of his living in 1644 on the ground of his loyalty. John Cleveland graduated at Christ's College, Cambridge, in 1631, and three years afterwards obtained a Fellowship at St. John's. But his political opinions and his satires upon the Parliamentarians led to the loss of his preferment, and though the king did something for him, he was, after being imprisoned at Yarmouth as a danger to the Commonwealth, and released by Cromwell, who seems to have been good to him, compelled to become a wandering beggar. His best satire is a *Petition to the Lord Protector for the Scots Rebels.* Cleveland might well have sat to Sir Walter Scott as the prototype of Roger Wildrake of Whittlesea Mere.

Cleves, a Prussian town, once the capital of the duchy of Cleves, but now a town in the government of Düsseldorf, and situate 46 miles N.W. of that town. It is built on the sides of three hills, and being as it is near the frontiers of Holland, it is almost Dutch in style. A canal connects it with the Rhine, from which it is two

miles distant. In its 14th century church are some fine monuments to former dukes. The name is familiar to Englishmen, as giving her title to Anne of Cleves, one of the wives of Henry VIII., whose reception of her, though not complimentary, was more satisfactory in its results than the treatment most of his wives met with. There is a large park at Cleves, and a fine old castle of Schwanenburg, the birthplace of Anne of Cleves. The chief industries are the manufacture of cotton, linen, silk, tobacco, and woollens.

Cliché (Fr., p.p. of a verb *clicher*, connected with *cliquer*, and carrying the idea of clapping down or fixing) is used as a substantive to denote in electrotype or stereotype the solid impression first taken from the movable type, and forming the matrix of the final stereotype. In French the word *cliché* denotes also the negative of a photograph. The word also denotes the impression taken of a coin or medal in order to judge of the appearance and progress of the work.

Clichy, a village in the department of the Seine, on the right bank of the Seine, and to the N.W. of the fortifications of Paris, to which it forms a suburb. The chief productions are steam-engines and laundresses, and there are glass and chemical works.

Click Beetles, a group of beetles belonging to the Elateridæ, and allied to the fire-flies; their popular name is due to their habit of leaping up with a slight click when disturbed. Their larvæ live in mould, and as they are long, wire-like, and tough have received the name of wireworms.

Client. This term is supposed to be derived from the Latin word *clues*, but this is somewhat doubtful. In ancient Rome there existed the relation of patronage (*patronatus*) and clientship (*clientela*). The *clicns* was a dependent of the family of the patron, and the relation was kept up between their descendants. Dionysius gives a summary of the relation of patron and client. When a man manumitted a slave he became the patron (*patronatus*) of the person, who thus became a free man (*libertus*), and he had certain rights with respect to such freedom. The relationship existing at Rome between patron and client facilitated the formation of similar relations between foreigners and Roman citizens; the foreigner thus obtained a protector and perhaps a friend, and the Roman increased his influence by becoming the patron of men of letters and of genius. Under the Empire the clients were mere hangers-on of rich people, who called daily upon them and received a small present for doing so. As a Roman client was defended in law-suits by his patron, the word "client" is used in modern times for any one who is represented by a solicitor or barrister.

Clifford, an English family name, famous both in history and romance, deriving its origin from a Walter, who in the 12th century became possessed of Clifford Castle on the Wye, and adopted the name of the castle as his own surname. Fair Rosamond was this Walter Clifford's daughter.

Clifford, William Kingdon (1845–1879), an English mathematician and writer on philosophical and mathematical subjects. The son of a bookseller at Exeter, he was educated at that town, at King's College, London, and at Trinity College, Cambridge, of which society he became a fellow in 1868, after coming out in the Tripos as Second Wrangler. Besides writing and lecturing he was professor of mathematics and mechanics at University College, London, from 1871 till his death in 1879. He united great originality as a thinker with an exceptional power of clear exposition. Originally an ardent High Churchman, he afterwards attacked Christianity and Theism. His lectures and essays have been collected and edited by Sir F. Pollock. Among his other works are *The Common Sense of the Exact Sciences*, and valuable mathematical papers.

Clifton, in Gloucester, forming a fashionable suburb of Bristol (q.v.), and noted for its romantic situation on a gorge through which the Avon flows, and over which passes a suspension bridge, once on the Thames at Charing Cross, uniting Gloucestershire with Somerset. The once famous hot springs of Clifton have now lost most of their fame. Clifton College is a well-known public school.

Climacteric (Gk. *climax*, a ladder). Certain years of life were looked upon by the ancients as having a particular importance, forming steps or stages in a man's career at which he was especially liable to suffer from disease. The multiples of 7 were said by some to be the climacteric years, others preferred to attach importance to the multiples of 9. At all events, much importance was attached to the year $63 = 7 \times 9$, which was called the grand climacteric, and it was held to be matter for congratulation if an individual passed through this year of his age without mischance.

Climate etymologically denotes a slope, and was formerly used to denote the imaginary zones into which the earth's surface was divided, not, as now, according to temperature, but according to the change of time. It is now used somewhat loosely to denote the complication of conditions of temperature, rainfall, exposure to or protection from winds, height above sea-level, and so forth, that tend to make a region favourable or otherwise to human life or happiness. There are people who would call the climate of England temperate and good. The word seems properly to denote the permanent and generally prevailing conditions as distinguished from varying details. The weather may change from day to day, but the climate only changes gradually and, for the most part, imperceptibly.

Climax (the Greek word for a ladder), a word used formerly in rhetoric, and now adopted into popular language. In rhetoric the word was applied to an advance from strong to stronger terms. Cicero's well-known description of Catiline's departure from the city—"*abiit, excessit, evasit, erupit*"—is an example of climax; and everyone must have experienced a moment when matters have

come to a climax and forced immediate and decisive action one way or other.

Climbers, a translation of the Latin *Scansores*, an old name for a group of birds, many of which have little in common but moderate power of flight and the ability to climb with great ease. Here were placed the parrots, cuckoos, woodpeckers, toucans, barbets, and plantain-eaters.

Climbing Perch (*Anabas scandens*), the "Tree-climber" of the natives, a small Indian fresh-water fish of the Acanthopterygian family Labyrinthici, in all which there is situated above the gills an accessory organ for the oxygenisation of the blood, so that the species can subsist in semi-fluid mud, or even live for a time out of the water. This fish is distributed over the Indian region, and there is no doubt that it can travel for some distance on dry land, progressing by means of the spines of the gill-covers and of the anal fin, and breathing by means of its accessory superbranchial cavity. In the *Linnæan Transactions* for 1797 there is an account by an eye-witness of the ascent of a palm-tree by a climbing perch. Tennent (*Ceylon* i., 217) considers this to have been phenomenal, though the native name would seem to show that the practice is common.

Clinical Medicine (Gk. *kline*, a bed) is that branch of medical science which is concerned with the actual study of the phenomena of disease as witnessed at the bedside of the patient.

Clinker, the name given to the slag in iron-furnaces. It is also applied to smithy-scale, the oxide formed when red-hot iron is worked with the hammer. Geologists give the term to the crust of certain lava-streams.

Clinkstone. [Phonolite.]

Clinometer, an instrument for measuring angles of inclination to the horizontal plane. It is convenient to surveyors for the measurement of the slopes of cuttings or embankments, for taking the dip or inclination of a stratum, or for similar purposes. There are different forms of the instrument, but the principle is simple; if a bar be ranged along the slope, a plumb-line suspended from it will make with it an angle equal to the inclination of the slope to the vertical. A spirit level adjusted horizontally will make with the bar an angle equal to its inclination to the horizontal. Either of these angles may be read on a graduated quadrant fixed to the bar.

Clinton. 1. An American town on the Mississippi, in the state of Iowa, and the capital of Clinton county. An iron bridge 4,000 ft. long here crosses the river, and the town has railway workshops, and a large timber trade.

2. An American town on the Nashua, in the state of Massachusetts, in the county of Worcester. It has an extensive cotton and woollen manufacture, and was the first town to weave wire cloth.

Clinton, the name of an American family, distinguished in the history of the country. The most noted member was perhaps De Witt Clinton (1769–1828), whose mother belonged to the Dutch De Witts. Called to the New York bar in 1788, he was for twelve years mayor of New York and Lieut.-Governor of the state of New York from 1811–1813, and again at four intervals till 1826. His great work was the bringing about of the construction of the Erie Canal, which he lived to open in 1825.

Clinton, Henry Fynes (1781–1852), was born at Gamston in Nottinghamshire, and educated at Southwell, Westminster, and Christ Church. He sat in Parliament for twenty years from 1806, but classical studies were his chief pursuit; and his chronological works, the *Fasti Hellenici* and *Fasti Romani*, have a great reputation.

Clinton, Sir Henry (1738–1795), a British General, son of the Hon. George Clinton, Governor of Newfoundland, and later of New York. Entering the New York militia, Henry Clinton passed to the Guards, and served with distinction on the Continent, rising in 1772 to the rank of Major-General. After sitting in Parliament he went to America, and was knighted for his services there. In 1778 he succeeded Howe as Commander-in-Chief in America, and in 1780 he captured Charleston, and with it the Southern army. In 1781, after Lord Cornwallis's capitulation, Sir Henry returned to England, and published a history of the campaign. In 1794 he became Governor of Gibraltar, where he died.

Clio. 1. One of the Nine Muses, whose special attribute it was to patronise history, and it was, perhaps, for this reason that Herodotus named the first book of his history after her, thus giving her the preference over the other eight. Addison's papers in the *Spectator* are signed with one or other of the letters composing her name.

2. The name of a boring sponge which riddles the shells of oysters, etc. Though the spicules have not been found fossil, its presence in early times is inferred from the galleries bored through fossil shells.

Clipper, a word of somewhat doubtful etymology, possibly from a German or Norse word meaning to run fast, is used to denote a sailing vessel whose lines and rigging and general arrangement were considered most conducive to speed. Baltimore, in the United States of America, was specially noted for the building of clippers. Before the general adoption and improvement of steam locomotion, clippers were of much importance, and the race home of the tea-clippers from China was a matter of great interest in many ways. Now the clipper is chiefly important in yacht-racing and similar ornamental or pleasure sailing, since in ordinary navigation if speed is required steam is employed, and if it is not required, the build of the vessel is a matter of small moment.

Clistenterata, one of the two subdivisions of the class Brachiopoda. They include those forms in which, with rare exceptions, the two valves of the shell are connected by a hinge (hence also known as the Articulata): the shell is composed of

long prisms of carbonate of lime obliquely arranged: they have no anus (whence the name "closed guts"). These are the three characters that separate them from the TRETENTERATA. The Clistenterata include the great majority of the Brachiopoda, and many of the best known forms; for example the common "Lamp Shell" (*Terebratula*), found rarely in the deeper waters of our coasts; also *Waldheimia*, an allied genus, and *Rhynchonella*, species of both of which occur living in the British area. Most of the species and several of the families are, however, extinct; thus the *Spiriferidæ*, which had a complicated spiral support for the arms, and the large thick-valved, and often concavo-convex *Productidæ*, are almost limited to the Palæozoic age. In many extinct species and one living one (*Rhynchonella dœderleini* from Japan) the shells are covered with long spines.

Clitellum is a ring round the body of a worm caused by the expansion of the walls of several segments by the development of glands connected with copulation.

Clitheroe, an English manufacturing town and municipal borough, near the Ribble, in the county of Lancashire, situate at the foot of the Pendle Hills, 28 miles north of Manchester. Its industries are cotton and paper manufacture, iron founding, and lime and brick-works. It played an important part in the Scottish wars, and also in the Civil war, during which (1649) the castle was dismantled. Stonyhurst College is near Clitheroe.

Clive, CAROLINE (1801–1873), an English novelist and poetess, daughter of Mr. Meysey Wigley, and wife of the Rev. Archer Clive. She is chiefly known by her novels of *Paul Ferroll* and *Why Paul Ferroll killed his Wife*.

Clive, KITTY (1711–1785), an English comic actress, the daughter of an Irish lawyer named Raftor. Most of her playing was at Drury Lane from 1728 to 1769, in which latter year she retired to Twickenham. In 1731 she married a barrister named Clive, but soon separated from him. She was a friend of Garrick, Handel, and Horace Walpole, and between Dr. Johnson and her there was a mutual liking.

Clive, ROBERT (1725–1774), Lord Clive and Baron Plassey, is generally looked on as the virtual founder of our Indian empire. Born in Shropshire, he went in his nineteenth year to India as a writer under the East India Company, but soon quitted that employment for the army. He acted so well in attacking a fort of the Rajah of Tanjore, that he was appointed commissary. His next exploit was to advise and carry out an attack upon Arcot, which resulted in a victory and the drawing off the French from Trichinopoly. After several other victories, Clive embarked for England, and there received a present from the Hon. East India Company, and was made lieutenant in the royal service. On his return to India he marched against Surajah Dowlah, and by the battle of Plassey completely broke his power. He was made Governor of Calcutta, and had firmly established the English power before he returned to England to be rewarded with a peerage. Once again he returned to India, but took no further part in military matters, although his political measures were of great service to the empire. In 1767 he came for the last time to England with rank and great wealth, only to meet the reward that often awaits those who have worked for their country. He was accused in the House of Commons of having abused his power, and the injustice of his enemies, though it failed, drove him to commit suicide. Lord Macaulay and Mr. Gleig have made us familiar with the events of Lord Clive's life, and there is a portrait of him in the National Portrait Gallery.

Cloaca, the chamber into which the intestinal canal and the urinary and generative ducts open in some invertebrates and fishes, in all amphibians, reptiles, and birds, and in the Prototheria (q.v.).

Cloaca Maxima, the Latin name of a large drain or tunnel, formed by Tarquinius Superbus or by Tarquinius Priscus, to drain the marshes which made some of the low-lying parts of ancient Rome well-nigh uninhabitable. The work was so well done that much of it remains to this day, and its preservation was made a matter of importance at several epochs of Roman history.

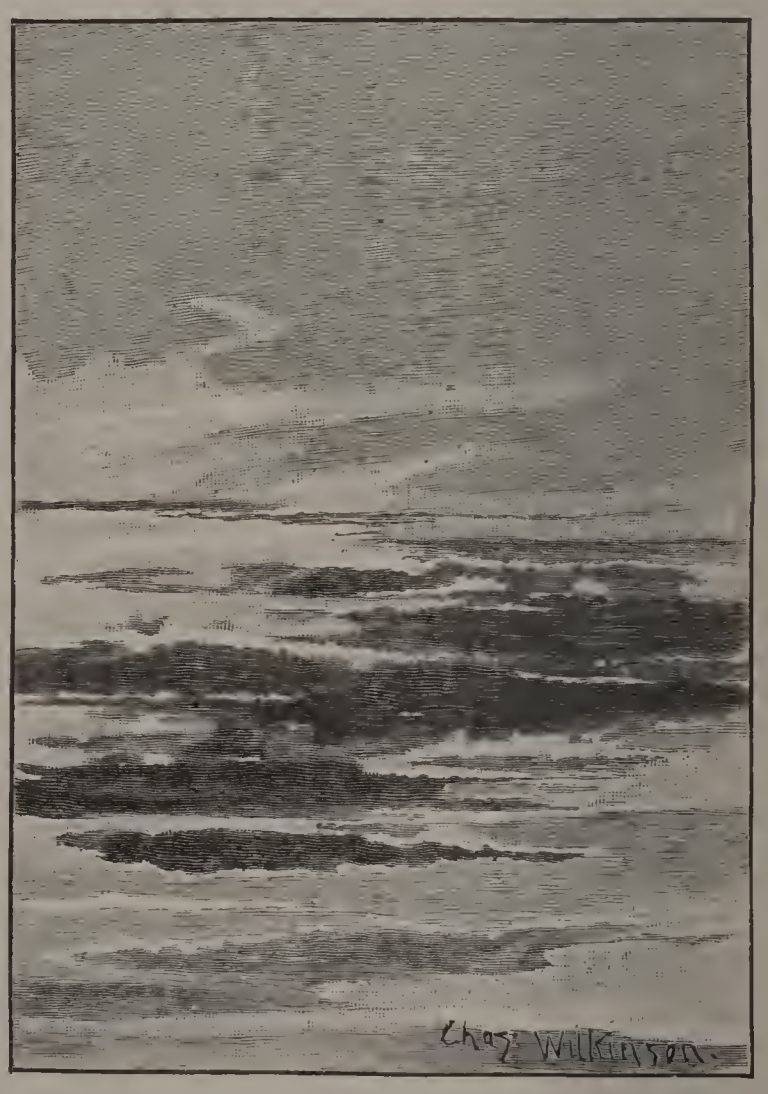
Clocks, a word by etymology meaning a bell, was at first applied to such time-measuring instruments as were fitted with a bell or bells whereon the intervals of time were mechanically struck, and then, by extension, to any time-measuring instrument, and lastly to such of these instruments as are too large to be conveniently carried about the person. In these days of tiny carriage clocks it would be difficult to draw a line of real distinction between a clock and a watch. To attempt a history of clocks or a description of them would require a volume. Clock-making has formed a fascinating study for many people; and many ingenious dispositions of mechanism have been applied to them. The great clock of Strasburg is well known, and in fiction most people are acquainted with the major's clock in Wilkie Collins's *Armadale*. The collection of clocks at the British Museum is of great interest whether from a mechanical or ornamental point of view. The ancients used water-clocks [CLEPSYDRA] and sand-glasses to mark the time. From an ornamental point of view French clocks hold a high place, but they are not renowned for going qualities. Among English clocks that of Westminster is one of the most remarkable, not merely on account of the gigantic scale of its accessories, but also for its wonderful accuracy, since its average deviation only amounts to a second a week. The Swiss are noted for their clock and watch-making.

Clog Almanac, a form of almanac anciently in use, consisting generally of a four-sided piece of some hard wood upon which the different days of the year were marked down. Each side would contain three months, the days being marked by notches, the first day of the week having a larger notch than the others, or otherwise distinguished, and against festivals or other remarkable days symbols were drawn to denote them. Some of the existing almanacs have Runic (q.v.) characters.

1

2

3



4

CLOUDS.

1 Cirrus. 2 Cumulus. 3 Nimbus. 4 Stratus.

Great variety of style naturally existed in their arrangements. Many museums contain specimens.

Cloister (Lat. *claustrum*, an enclosure), the name applied to a passage running round (generally) the inner wall of a monastic building, built in a quadrangular form, and looking upon the central enclosure. It was intended usually to permit the monks to enjoy the open air without being entirely exposed to the weather while carrying on their education, work, or meditation, or taking exercise. Some English cathedrals have cloisters, and the cloisters of Westminster Abbey are familiar to many people. New College and Magdalen College, Oxford, have good cloisters. The cloisters may be open to the ground on the exposed side, or built half up and lighted in the upper part by arcades, or may, as in some modern buildings in Great Britain, be lighted by glazed windows; but the same general idea of a passage into which rooms open runs through them all. The Campo Santo at Pisa has a famous cloister. By metaphor the term cloister is sometimes used to denote the profession of religion, while again the term "cloistered," as applied to religions, has a special and distinct signification.

Clonmel, a municipal borough of Ireland, on the Suir, in the province of Munster, in the counties of Tipperary and Waterford, 104 miles S.W. of Dublin. Part of the town is built upon two islands in the river, which are connected with the mainland by three bridges. The river is navigable for barges of fifty tons as far as Waterford, and the town possesses a brewery, flour-mills, and tanneries, and there is a trade in butter, cattle, and grain. Sterne was born at Clonmel.

Clootz, Jean Baptiste, Baron (1755–1794), generally known as Anacharsis Clootz (which name he assumed after a romance of the Abbé Barthélemy), was born near Cleves. Being rich, he was sent to Paris, where an anarchist uncle imbued him with wild republican ideas. After travelling, he returned to Paris in 1789, and posed as the orator of the human race. In 1792 he became a member of the Convention, and voted the king's death on behalf of the human race. He was hated by Robespierre, who excluded him from the Jacobin Club, and in 1794 he was guillotined, protesting in the name of the human race.

Close Time, the time during which the State or other authorities take wild birds and other animals under their protection, and forbid their destruction or molestation during their breeding season or, if necessary, at other times, so as to prevent their numbers from being too far diminished. Formerly applied only to game, the principle has now been adopted in the case of many animals. Negotiations are now going on with a view to securing an international close time for fur seals, since commercial greed seems otherwise likely to kill the goose that lays the golden egg.

Closure, an old English word used by Shakspeare and other writers in the sense of closing or enclosure, and now revived again to denote a practice adopted from the French *clôture*, *i.e.* to enable a debate in the Parliament to be summarily finished at the will of a certain majority. By the English rules of procedure any member may, with the consent of the Speaker or the Chairman, move that the question be now put, and if a majority of 200, or a majority of 100 against a minority of 40 or less, support his motion, the question is immediately put.

Clothes Moths, the Tineidæ, a family of Microlepidoptera, the larvæ of which feed on animal fabrics and thus damage clothes, etc. *Tinea tapetzella* is one of the commonest species.

Clotho, one of the three Fates—the daughters of Necessity—who spins the thread of man's life, which at the full time allotted, her sister, Atropos, severs with her shears.

Clotilda, St. (475–545), daughter of Chilperic of Burgundy, and wife of Clovis, King of the Franks, whom she converted. Her vengeance upon her uncle for the death of her father, mother, and brothers, brought about the union of Burgundy with France. After her husband's death she retired to Tours, where a church and statue perpetuate her memory. Her bones were burnt at the Revolution to prevent their desecration.

Clouded Tiger (*Felis macrocelis*), a large arboreal cat, ranging from the Eastern Himalayas to Borneo and the adjacent islands. It is about 42 inches long to the insertion of the tail, which is some 32 inches more. The ground colour is brownish grey, marked with large irregular blotches and stripes of black. It preys on sheep, goats, pigs, and dogs.

Clough, Arthur Hugh (1819–1861), an English poet, born at Liverpool of a Welsh family. His father, a cotton merchant, took him to Charleston, where he lived for some years, but was brought back to England and sent to school at Rugby, where Dr. Arnold thought much of him. In 1836 he passed on to Oxford, and in 1842 was chosen one of that charmed circle, the Fellows of Oriel, and tutor the year after. But he did not escape the religious fermentation of the time, and the sceptical habit of thought that he had developed forced him to resign his position. He first went to Italy, where he was present at the siege of Rome in 1849, and in 1852 he went to America, soon after returning to become an examiner in the Education Office. Made ill by overwork, he again travelled to Greece and Constantinople, and in 1861 he started again for the south, dying at Constantinople. Of his poems, perhaps the most widely known is the *Bothie of Tober-na-Vuolich*, written before he left Oxford. Another favourite is *Dipsychus* (1850). His lyrics also are much admired, and throughout his works there reigns the same sincerity, search after truth, and humour. Matthew Arnold has eulogised him in *Thyrsis*.

Clove, a term, perhaps originally implying cleavage or separation, applied to the small buds or bulbils formed in the axils of the scales of bulbs, as in garlic, by which bulbs multiply. It is still more commonly applied to the dried unopened

flower-buds of the small evergreen myrtaceous tree *Eugenia caryophyllata*, a native of the Moluccas, the cultivation of which was once restricted by the Dutch to the island of Amboyna, but is now extensively carried on in Penang, Zanzibar, and the West Indies. Here it is derived from the French *clou*, a nail, from the form of the bud with its long receptacular tube enclosing the inferior ovary. The fruits are imported as *mother cloves*, and the stalks are used to adulterate the spice when ground. The whole plant is aromatic from the presence of the essential *oil of cloves*, which occurs to the extent of 16 to 18 per cent. in the flower-buds. It is used in soap-making and perfumery extensively, and also in medicine, especially for tooth-ache.

Clovelly, a village on the coast of N. Devon, a few miles south-west of Bideford. Many who have not visited it are familiar from photographs, and descriptions by Kingsley and others, with the steps, and the white flower-covered houses rising tier upon tier to a height of several hundred feet.

Clover, from their leaves being cloven into three leaflets, is the name specially applied to the species of the leguminous genus *Trifolium*, cultivated as fodder-plants, and to a few similar plants. *Trifolium* is distinguished by the stipules adhering to the leaf-stalk, the small flowers crowded in a head, and the short, straight pod. The chief cultivated species are *T. incarnatum*, carnation clover, with long heads of deep crimson or white flowers; *T. pratense*, broad-leaved clover, and *T. medium*, zigzag clover, so-called from its bent stems, with deep pink flowers; and *T. repens*, Dutch or white clover, the shamrock (q.v.) of Ireland, and *T. hybridum*, alsike or so-called "hybrid" clover, with white or pink-tinged flowers. There are several other wild species in England. Bokhara clover, *Melilotus alba*, is an allied plant yielding much honey and very aromatic hay, which is a native of Britain.

Clovis (465–511), King of the Salian Franks belonging to the Merovingian line, and being the son of Chilperic I., whom he succeeded in 481. His first capital was Tournai, but after overthrowing the Gallo-Romans he transferred his court to Soissons. In 493 he married Clotilda (q.v.), and under her influence, and owing to the supposed aid of the God of the Christians in one of his battles, he became Christian, and, with many of his subjects, was baptised by St. Remigius. The Pope conferred on him the title of Most Christian King to mark approval of his orthodoxy in the midst of many Arians. In 507 he defeated Alaric the Visigoth, thus carrying out in a great measure his ambition of uniting the Franks under one ruler, but in the same year he received a check from Theodoric, king of the Ostrogoths. Thereupon he settled in Paris, where he died, after dividing his kingdom among his four sons.

Clowes, William (1540–1604), a distinguished English surgeon, who was surgeon at St. Bartholomew's, served in the Low Countries, and on board the English fleet during the Spanish invasion. He became surgeon to the Queen, and published several surgical works.

Club, by etymology, a clump or knot of men permanently united for any purpose, social, political, or other. The clubs of ancient Greece played an important part in the national politics, as they do also in modern times. The Carlton Club, the Reform Club, the National Liberal Club, in England, are well known, as are also the legion of social clubs which give to one part of London the nickname of "Clubland." The club, too, is a convenient method of promoting intercourse among the members of a profession, or those interested in any particular pursuit. The Travellers', the Oriental, the Athenæum, the Universities', the Services' Clubs are instances in point. Almost every amusement or pursuit of Englishmen is represented by its numerous clubs. Some consider the name to have been derived from the idea of clubbing or massing the expenses and dividing them equally among the members of the society, but this is doubtful, and at any rate is not of the essence of a club as now understood.

Clubfoot, a deformity of the foot caused by a contracted or shortened condition of some particular muscle or muscles. The malformation is usually congenital, *i.e.* exists from birth, and if neglected the parts adapt themselves to their unnatural relationship to one another, and the chance of cure becomes increasingly remote. The most common form of congenital clubfoot is called by the surgeons *talipes varus*. The child walks on the outer side of the foot, and in order to bring about the natural condition of things certain tendons may require to be divided (the tibialis anticus and posticus, and often the tendo Achillis) with a tenotomy knife. After the operation care must be taken to ensure that healing takes place in such a way that the foot is restored to its proper position. In *talipes equinus* the heel is drawn up by the shortening of the muscles of the calf; in *talipes calcaneus*, on the other hand, the foot is flexed and the toes lifted off the ground, so that the patient walks on his heel. In *talipes valgus* the peronei muscles are contracted and the sole of the foot looks outwards. Apart from congenital clubfoot, a paralytic form must be distinguished. Here the mischief is started by a paralysis, affecting some muscle or group of muscles attached to the foot. The antagonists of the muscles involved are now unopposed, and drag the foot from its natural position. In such a state of things operative treatment is less likely than in the congenital disease to be of avail. For, unless there is a restoration of the lost power in the paralysed muscles, there can never be a return to the natural conditions of health.

Club Mosses, two allied groups of plants, the *Lycopodiaceæ* and the *Selaginellaceæ*, resembling one another in general habit but differing much in their reproductive and minute structure. Though having some resemblance to mosses, they belong to an altogether higher grade of organisation, more nearly allied to ferns. At the present day they

are neither numerous nor of large size; but in Palæozoic rocks they are represented by gigantic forms, such as *Lepidodendron* and *Sigillaria* (q.v.), which have largely contributed to the formation of coal (q.v.). The chief existing genera are *Lycopodium* and *Selaginella*, which occur over the whole globe. They have thread-like, and generally procumbent branching stems covered with overlapping minute pointed leaves, and terminating in the club-like leafy spore-bearing cone from which the popular name is derived. Lycopodium produces only one kind of sporangium and spore, and is thus *isosporous;* Selaginella bears two kinds, *megasporangia* containing four relatively large female *megaspores*, and *microsporangia* enclosing numerous small *microspores*, and is thus *heterosporous*. The megasporangia correspond to the ovules and the microspores to the pollen-grains in the higher plants. Several kinds of Selaginella are grown for the beautiful metallic lustre of their leaves, and the spores of our British *Lycopodium clavatum*, or stag's-horn moss, are collected in Germany to cover pills, and to make theatrical lightning and other fireworks, they being oily and readily inflammable.

Clugny, or CLUNY, a French town on the Grône, a tributary of the Saône, in the department of Saône-et-Loire. It was renowned in the Middle Ages for the great Benedictine abbey, which was the parent of almost 2,000 affiliated convents in different parts of Europe. Cluny was second only to Rome in ecclesiastical importance, and its abbey church was second to none in Christendom before the building of St. Peter's at Rome. Of this only a few fragments remain. In 1790 the order was suppressed, and the magnificent library and records, which had been attacked and dispersed by the Huguenots (1652) and then strangely restored, was again attacked, scattered, and burnt in 1793; but much has been again recovered, and is carefully stored in museums, where it is of the utmost value for the light it throws upon monastic history and contemporary affairs. There is a certain amount of agricultural trade carried on, and the manufacture of paper, pottery, and vinegar. The abbots of Cluny had a house in Paris, the Hôtel Cluny. This is now a museum of archæological subjects.

Clupeidæ, a family of Physostomous fishes of which the herring (q.v.) is the type.

Clyde, one of the most important of Scottish rivers, third in point of size, but pre-eminent in commerce. Coming from several streams which rise at a height of several hundred feet above the level of the sea in the mountains that separate Dumfries, Lanark, and Peebles, and sometimes in flood-time bifurcating with the Tweed system, the Clyde passes by Lanark, Hamilton, and Glasgow, and falls into the Firth below Dumbarton. There are three celebrated falls on the Clyde, of which the most famous, Corra Linn, makes three leaps of 84 ft. in all over the rocks. Owing to the improvements made at Glasgow, vessels of the deepest draught can now go in, and the Clyde shipbuilding stands second to none. The Firth, which varies in width from one mile to nearly 40, and is 68 miles long, is one of the most important waterways of the world.

Clypeaster, a genus of irregular Sea Urchins, found most commonly in the rocks belonging to the Miocene system in the Mediterranean basin. One of the largest and best known species is *C. ægyptiacus*, common in Egypt. The Clypeasters are large, generally flat-based, provided with jaws, and with both the mouth and anus opening on the lower surface.

Clyster. [ENEMA.]

Clytæmnestra, in Greek mythology, daughter of Tyndareus, brother of Castor, and wife of Agamemnon, king of men, by whom she became mother of Iphigeneia, Electra, and Orestes. She slew her husband Agamemnon and Cassandra, who had fallen to his lot as mistress, as she herself alleges in Æschylus' *Agamemnon*, through jealousy of Cassandra, and to revenge the death of Iphigeneia. During Agamemnon's absence at Troy, however, she had lived with a paramour, Ægisthus (q.v.), with whom she was at last slain by her son Orestes (q.v.).

Cnidaria, a proposed subdivision of the Cœlenterata, including the Hydrozoa and Anthozoa, based on the presence in these of "thread cells." It thus emphasises the absence of those structures in the sponges, and the great affinity between the two groups to which it is applied.

Cnidus, now Tekir, a city of Caria in Asia Minor, chief city of the Doric league, and a flourishing port of antiquity. It is renowned for the sea fight in 394 B.C., and victory of Conon with his Athenians over Pisander with his Spartans. Aphrodite was specially worshipped here, and Praxiteles' famous statue of her was in one of the temples.

Coach, a word derived by some from the Latin owing to its resemblance to a shell, and by others from a Hungarian word, used to denote a covered vehicle formerly used by the rich as a mode of conveyance, and then applied to public conveyances used for the transport of passengers or mails, or both. The hackney coach was a common feature of London life half a century or more ago. The name is sometimes applied to railway carriages, which were at first built so as to resemble as much as possible the lines of a coach-body. A reaction has widely set in of late, both in England and elsewhere, in favour of employing coaching as an agreeable mode of travelling during the summer months. It is not so very long ago that people of rank travelled from place to place in their own coaches, which were drawn by post-horses. The verb and substantive "coach," used in an educational or cramming sense, must be considered to come under the head of Slang (q.v.).

Coach Dog. [CARRIAGE DOG.]

Coagulation. [BLOOD.]

Coahuila, a Mexican state bordering on Texas, from which it is separated by the Rio Grande.

Silver, coal, and other minerals have been found, and the state is generally fertile, but hitherto has been little developed.

Coaita, the native name of *Ateles paniscus*. [SPIDER MONKEY.]

Coal, a compact and usually brittle black rock, containing from 75 to 85 per cent. of carbon, burning readily with a clear flame, and composed of the compressed and altered remains of former vegetation. As this carbon was obtained from the air by the action of green plants under the influence of sunlight, the energy latent in coal has been correctly described as "bottled-up sunshine." [CHLOROPHYLL.] Though the "Better-bed" coal of the Newcastle coal-field is almost wholly made up of the sporangia of club-mosses, no trace of organic structure is usually discernible in coal. This is probably explicable by a fermentative process having taken place in the wood-fibre of the plants whilst naturally macerating in water, nitrogenous matter having thus converted this fibre into a morphous dextrinous or mucilaginous matter, with which the siliceous or other earthy impurities constituting the "ash" are most intimately mingled. Wood fibre seems to have undergone a slow oxidation under water, so that the action of air was excluded, losing about 75 per cent. of its weight, much of its hydrogen and oxygen, and almost all its alkaline constituents.

Coal occurs in beds or seams belonging to various geological formations, though mostly to the upper part of that known in consequence as the Carboniferous (q.v.). The plants concerned in its formation differ according to its geological age: those of the Carboniferous and other Palæozoic formations were mainly club-mosses (*Lycopodinæ*), horse-tails (*Equisetaceæ*), and ferns. In the Trias and Jurassic, cycads predominate; and in the Brown Coal of the Oligocene of Germany, exogenous angiosperms prevail. Though some local patches of coal of great thickness may be due to the drifting out to sea of rafts of vegetable matter, the seams have usually a bed of fire-clay or shale below them which is often penetrated by roots (*Stigmaria*), continuous with stems in the coal itself, and demonstrates the seam to have been formed by the accumulation of vegetable matter which grew on the spot, the clay or shale being the ancient soil.

Seams vary in thickness from less than an inch to several feet, those between 3 and 7 feet thick being usually most constant, while very thick seams are really each several seams with thin shaley "partings." The "ten-yard" seam of South Staffordshire is made up of eight such seams. The upper part of the Carboniferous System (q.v.), a great series of sandstones and shales, with occasional beds of fire-clay and coal, known as the Coal Measures, has in most countries been much disturbed by subterranean movement, and thrown into folds of which the horizontal and anticlinal (q.v.) portions have been generally denuded, so as only to leave isolated synclinal areas or *basins*, and the districts over which these areas are worked are known as *coal-fields* (q.v.). This folding has produced jointing (q.v.), so that coal commonly breaks up into roughly cubical pieces, having two glossy surfaces, or *cleats*, along the master-joints, the direction in which the main galleries of a mine are usually carried, two more irregular *ends* and two powdery surfaces of bedding. Some coal breaks down into dust or *slack*. *Faults* (q.v.), known locally as *heaves* or *troubles*, *i.e.* dislocation of the strata, are also common in our coal-measures; and in some cases, as in the South Wales coal-field, folding has caused a gradually increasing intensity of the carbonising process, so that the same seams pass from the condition of coking coal in the east, through that of steam coal, to that of anthracite (q.v.) in the most contorted western part of the field. Gases, especially marsh-gas or *fire-damp* (CH_4), often occur in considerable quantity in coal, and escaping into the workings, especially when atmospheric pressure is reduced, may, on contact with naked lights, produce serious explosions.

Among the chief varieties of coal are lignites, caking coals, cannel coal, bituminous coal, and anthracite (q.v.). *Lignite*, or brown coal, mostly Tertiary in age, contains less than 70 per cent. of carbon, much oxygen and ash. *Caking* or *coking coals* are so called from softening when heated, so that when air is excluded most of the carbon remains in a compact mass known as *coke*. *Cannel coal*, so called from its flaming readily like a candle, with a low carbon percentage, contains so much "disposable hydrogen," *i.e.* hydrogen beyond that needed to form water with its oxygen, as to be the best gas-making coal. *Bituminous coals* are misnamed, since they contain no bitumen; but at a low temperature they are partly fused and form hydrocarbons.

We have, perhaps, no exact existing analogue to the formation of coal, the nearest approach to one being probably the mangrove swamps and cummerbunds of low-lying tropical coasts in which arborescent vegetation spreads out into sea-water. The whole series of coal-measures was laid down during a period of prolonged but intermittent subsidence, the commencement of each seam marking a pause in, and its upper termination the recommencement of, such sinking.

Coal Fields differ greatly in size. There are about twenty in England and Wales, but half of this number are but small in area. The largest is that of South Wales, with a total area of about 1,000 square miles, about half of which yields anthracitic and the other half bituminous coal. Other important fields are the Northumberland and Durham, the York, Derby, and Nottingham, the Cumberland, the South Lancashire, the North Staffordshire, the South Staffordshire, the Flintshire and Denbighshire, the Forest of Dean, and the Bristol and Somersetshire. The five principal coal-fields in Scotland are those of Ayrshire, Lanarkshire, Stirling, Fife, and Midlothian, in addition to which there is the small Jurassic coal-field of Brora, in Sutherlandshire. Of the but little developed coal-fields of Ireland, those of Leinster, Tipperary, and Munster, the most important are anthracitic, that of Tyrone is bituminous. The total output of coal in the United Kingdom during

the last ten years has been of the average annual value of £49,000,000 sterling. The Royal Commission in 1870 estimated the available unworked coal in the kingdom within 4,000 feet of the surface at 146,454,000 tons, or more than 1,260 times the amount consumed in 1870. Increasing consumption in manufactures and increasing population have, however, caused some authorities to limit the duration of our supply to 360 or even to 276 years. No estimate was made in 1870 of any coal between the Bristol and Somerset field and that which extends from Valenciennes to Namur and is continuous with the Liège and Westphalian fields. Coal having since been found at Burford, on the borders of Oxfordshire, and at Dover, the south-east of England becomes an area to be considered. Though the coal-fields of the United Kingdom, with a total area of 12,000 square miles, now yield one hundred and fifty-five million tons, or more than half that of all other countries put together, this is only owing to the undeveloped state of the resources of these latter. Thus the United States, with fields estimated at 192,000 square miles, only produce one hundred million tons, whilst China, with 200,000 square miles, more than the whole coal area of Europe, only produces three million. Germany produces eighty million tons, France twenty million, and Belgium and Austria each seventeen million; but Canada, with a coal-bearing area of 65,000 square miles, India with 35,500, New South Wales with 24,000, and Russia with 20,000, produce far less. Valuable coal deposits occur in Borneo and Labuan.

Coal Fish (*Gadus virens*), a fish of the cod family, abundant on the North American coast, and ranging into the Mediterranean. It is very voracious, and occurs in large shoals; the upper parts are black, lighter below. The average length is about three feet. The flesh is excellent, and the fish is dried for export like cod (q.v.).

Coal Gas. The ordinary gas employed for illuminating purposes is obtained by the distillation of coal. For its preparation this rock is heated to a bright-red heat in large cylindrical retorts built of firebricks. A mass of coke or gas carbon remains in the retorts, and gases are evolved which require to be purified. They are therefore passed first into a large iron pipe in which tar and a watery distillate condense, the latter containing quantities of ammoniacal salts, and known as *ammoniacal liquor*. The gas and these liquids pass next into the *tar-pit*, where the latter are collected, the gas passing further through a system of iron pipes, the *refrigerators*, in which more of the tar and ammoniacal liquors are condensed and collected. It then passes up the *scrubbers*, wrought iron towers loosely filled with coke, in which it meets a fine spray of water. After leaving the scrubbers the gas consists chiefly of hydrogen, marsh gas, hydrocarbons known as olefines, carbonic oxide, nitrogen, carbonic acid, and sulphurretted hydrogen. These two latter require to be carefully got rid of, as they exert deleterious effects, to the last being due the blackening of silver and gilding, etc., by gas. It therefore passes, in the *purifiers*, over layers of a mixture of slaked lime, oxide of iron, and sawdust, which absorb these noxious constituents. From the purifiers the gas is collected in the large gasometers, from which it is distributed to the mains, the supply being regulated by a governor. The best coal for use in the manufacture of coal-gas is that non-flaking coal found largely in Staffordshire, Newcastle, Wigan, etc. The illuminating power of gas is reckoned in terms of standard sperm candles, against which it is tested when burning five cubic feet per hour. The Gas Works Act provides that the gas supplied shall not be less than sixteen candle-power. The same Act limits the quantity of sulphur in the gas to a certain small amount, and the quality of gas in London in these and other respects is frequently tested in various places by the "gas referees."

Coal Tar. The tar obtained during the manufacture of coal gas (q.v.) is a thick viscid black liquid, which was formerly used only for tarring wood, etc., and was of no commercial value. By distillation, however, it was found a number of products were obtained which were classified as *light*, *intermediate*, and *heavy* oils. The light oil was used as an illuminant, and the heavy or creosote oil was employed for "creosoting" timber to prevent decay. At the present day, however, the coal tar is chiefly valuable as being the primary source of the large class of compounds derived from benzene, and especially of the important and ever-increasing group known as the "coal-tar colours." The first step towards this was the discovery of *benzene* itself in coal tar by Hoffman in 1845, and the preparation in 1856, by Perkin, of *mauveïne*, the first aniline dye. Since that time colouring matters of every variety of colour and shade have been added to the list, the most important addition, perhaps, being that of *alizarin* (q.v.), the colour principle of the madder. *Naphthalene* (q.v.) and *anthracene* (q.v.) were also discovered in the previous waste product, and with their derivatives form an important class of commercial substances. The colour industry is not the only one affected by the study of coal tar. To it we owe, among many others, the well-known pharmaceutical preparations *kairine* and *saccharin*, and the photographer is indebted for his isochromatic plates and the developers *hydroquinone* and *eikonogen*. After the distillation of the volatile products from the tar, a black substance, *pitch*, is left behind, used largely for preparation of asphalte, varnishes, patent fuel, etc.

Coalition, by etymology the union of particles to form a new compound, is applied in politics to a temporary union of different parties, in which each party sacrifices some of its own individuality for the sake of better carrying on of the business of the State. Though party government is attended by many evils, coalition has seldom been either permanent or satisfactory.

Coanza, a West African river in the country of Angola. Rising in the Mossamba mountains, and receiving several tributaries, it has a course of about 600 miles to the sea; but owing to falls, is

not navigable for large boats farther than 140 miles from the mouth.

Coatbridge, a town of Lanark in Scotland, about 10 miles E. of Glasgow. It has made great progress of late, and is a municipal borough. The position as the centre of a great mineral district makes it a favoured spot for iron works, the most famed of which are the Gartsherrie works of Messrs. Baird.

Cobalt (symbol Co., at. wt. 58·6), is a reddish-white malleable metal of specific gravity 8·9, which is found naturally, in combination with arsenic and sulphur, as *smaltine* ($CoAs_2$), and *cobalt glance* (CoAsS). The metal is slightly magnetic, and dissolves slowly in acids. It forms two oxides, the *cobaltous* (CoO) and *cobaltic* (Co_2O_3), which form corresponding series of salts. Of these the *cobaltous chloride* is sometimes used for *sympathetic inks*, as writing in this compound, though invisible when cold, becomes blue on warming. Cobalt compounds are also used for imparting a blue colour to glass and porcelain, and for the manufacture of pigments, as *smalt*, by fusing cobalt ores with quartz and potashes; *Thenard's blue*, by heating the oxide with alumina; *Rinman's green*, in which oxide of zinc takes the place of alumina; and others.

Cobaltite, or COBALTINE (CoS_2+CoAs), the arseno-sulphide of cobalt, is a silver-white mineral with a pinkish tarnish, resembling pyrite in crystallising in the cubic system. Heated in the closed tube it is unaltered: in the open tube it gives off sulphurous fumes and a sublimate of arsenious acid. It has a greyish-black streak, and also resembles smaltite (q.v.) in hardness (5·5 to 6) and specific gravity (6·4 to 7·2). It is a valuable ore of cobalt, and occurs at Botallack and St. Austell, in Cornwall; in Sweden, Norway, Westphalia, etc.

Cobbe, FRANCES POWER, born 1822, an English author who has written voluminously upon subjects theological, scientific, and economical, and practical, besides producing some records of travels. She has made some curious and interesting observations upon unconscious cerebration. She has also maintained a vigorous crusade against vivisection and its supporters.

Cobbett, WILLIAM (1762–1835), an English writer of much vigour. Born at Farnham, he began life as a farm labourer, then came to London and became a lawyer's copying clerk. Tired of this, he enlisted, and after seven years' foreign service, where he educated himself by a course of rigid self-denial, he was discharged with the rank of sergeant-major. After going to France and America he came back to England and started first a paper called *The Porcupine*, and then the *Weekly Register*, and for a time he supported the Tory Government. But a prosecution for libel seems to have soured him and turned him into a Radical. After two unsuccessful attempts to get into Parliament he was returned for Oldham in 1832, but lived for too short a time to make any mark. He was a violently prejudiced partisan, but his writing is agreeable, and there are people who set great store by his *Grammar*, and his *Rural Rides* are interesting for their descriptions. On the whole he is a brilliant example of a self-taught man.

Cobden, RICHARD (1804–1865), the great promoter of free trade, was born at Midhurst in Sussex. Beginning as an apprentice in a warehouse he became a commercial traveller, and in 1830 a partner in a Manchester cotton house. He threw himself actively into life, interesting himself in reform and political economy, and in the advancement of Manchester. In 1838, the year of forming the Anti-Corn Law League, he gave himself heart and soul to its advancement, and entering Parliament in 1841 he saw Sir Robert Peel convinced in 1846, and the Corn Laws doomed. A national subscription was made for him, and in his absence on a continental tour he was elected for West Riding. He was a consistent member of the Peace Society, and his attitude with regard to the Crimean and China wars gained him much unpopularity and cost him his seat. While absent in America he was again returned to Parliament, this time for Rochdale. He refused several offers of place and honours, but successfully negotiated a commercial treaty with France. For some years his health had been precarious, and his last and fatal attack was owing to his eagerness to attend to his parliamentary duties. His death raised a universal feeling of regret at home and abroad. His biography has been written by Mr. John Morley.

Coblenz, a strongly fortified city, upon the tongue of land formed by the junction of the Moselle and Rhine, each of which rivers is crossed by a railway bridge, and by a foot bridge, that over the Moselle being of stone, and that over the Rhine a bridge of boats. The old town is dirty and irregular, but the new town by the Rhine is of a modern character. There are some fine buildings; among them the church of St. Castor, at the extreme point of the tongue of land, which dates from the 12th century, and occupies the site of the oldest Christian church in Rheinland. The Liebfrauenkirche and the old town hall are also interesting. The ancient palace of the Electors of Trèves is now a factory, as is also the archiepiscopal palace. The palace of the last century has some fine Gobelin tapestry. Coblenz is the centre of an active wine trade, and exports a vast quantity of mineral waters, and manufactures japanned ware, linens, cottons, and tobacco. Known to the Romans as Confluentes, Coblenz belonged to Trèves almost till the war of the French revolution, when it was made capital of the French department in 1798, and was given to Prussia in 1815. Across the Rhine opposite Coblenz is the famous fortress of Ehrenbreitstein.

Cobra da Capello (Portuguese, *hooded snake*), usually abbreviated to cobra (*Naja tripudians*), a very venomous snake of the family Elapidæ [CORAL SNAKE], from India, and some of the islands of the Eastern Archipelago. There are several varieties, and the length of large specimens is from five feet to six feet, with a maximum girth of

about six inches. The general colour on the upper surface is a uniform brown (which may be light or dark), bluish-white below. These snakes have the power of extending the anterior ribs, and thus dilating the skin of the neck so as to form a kind of hood. In one variety there are dark markings, something like a pair of eye-glasses on the hood, and in another these are reduced to one or more eye-like spots. A cobra, with erected head and dilated hood ready to strike presents a very menacing appearance, but, fortunately, these reptiles are not aggressive, and rarely attack man unless disturbed. Their bite is usually fatal to man, and medical treatment is rarely effectual. Stone heaps, holes in masonry and in the ground, and the roofs of native huts are their favourite haunts, though they climb well, and can swim rapidly. They are most active by night, and feed on mice and rats, birds, and their eggs, small reptiles and insects. The cobra plays an important part in Hindu mythology, and is the serpent usually chosen by charmers for their performances. The Egyptian cobra (*N. hajc*) is a closely-allied species [Asp], as is also the Ring Hals snake (*Naja* or *Sepedon hæmachatcs*).

COBRA DA CAPELLO. (*Naja tripudians.*)

Coburg, in the duchy of Saxe-Coburg-Gotha, and the capital of the duchy of Coburg, is on the left bank of the river Itz, about 80 miles from Eisenach. Among the chief buildings are the 16th-century palace, the arsenal, and the Duke of Edinburgh's palace. On a height is situated the old palace which gave Luther shelter, and was besieged by Wallenstein. It is now a museum. In the market-place is a statue to Prince Albert, who was born a few miles away. Among the industries of Coburg are the manufacture of carriages and the export of beer.

Coca, the carefully-dried leaves of *Erythroxylon coca*, the most interesting of the seventy species of the only genus of the *Erythroxylaceæ*, an order of tropical shrubs and trees related to *Sapindaceæ*. The plant is a shrub with scattered, smooth, stipulate, oval leaves, having strong inframarginal veins and small white flowers. The leaves mixed with lime or wood-ashes are chewed by Peruvian Indians and other people of the north-west of South America as a nerve stimulant, and as an aid to the digestion of large quantities of the dried, starchy, tuberous roots of the sweet potato (*Batatas edulis*). So sustained, the Indians are capable of prolonged fatigue.

Cocaine, an alkaloid of composition $C_{17}H_{21}NO_4$, which occurs in the leaves of the above plant, from which it can be obtained. It forms colourless crystals, melting at 98° C. It is used in surgery as a local anæsthetic, owing to its power of imparting insensibility to pain to parts touched by it. As it further, if applied to the eye, causes also dilation of the pupil, it is especially useful in ophthalmic operations. For these purposes the hydrochloride is the salt generally employed. When employed medicinally it is of importance that the alkaloid should be pure. There are two pharmacopœial preparations, cocaine discs (lamellæ cocainæ), and the liquor cocainæ hydrochloratis.

Cocceius (Koch) John (1603–1609), a Dutch scholar, and professor of theology at Leyden. He wrote a valuable Lexicon and commentary upon the Old Testament, and he held that the Old Testament was a type of the New, and believed firmly in the Millennium. He published several volumes of theology, and one of his works was published posthumously.

Cocceji, Henry (1644–1719), a baron of the empire, who, after studying jurisprudence at Leyden, went to England, from which he returned in 1672 to be made professor of law successively at Heidelberg, Utrecht, and Frankfort. His work on Civil Law had much renown.

Cocceji, Samuel (1679–1755), son of the above, studied jurisprudence, and was charged with the task of codifying the Prussian Law. In 1727 he was made a minister of State, and in 1746 he became Grand Chancellor of Prussia under Frederick the Great. He edited *Grotius de Jure Belli et Pacis.*

Cocculus Indicus, the dried berry-like fruit of the climbing menispermaceous plant *Anamirta Cocculus*, a native of the East Indies. The seeds contain from one to four per cent. of the acrid irritant poison picrotoxin ($C_{12}H_{14}O_5$), and are used as a black extract in India in some skin diseases and to destroy vermin. Though now discarded from our Pharmacopœia, they are imported to the extent of 50,000 lbs. annually at a price of from seven to nine shillings per cwt., mainly for re-exportation. This substance has been used to poison fish, and is popularly, but probably erroneously, thought to be an adulterant of porter.

Coccygomorphæ, a group of birds in Huxley's classification, containing the cuckoos, kingfishers, goatsuckers, trogons, motmots, rollers, todies, hoopoes, hornbills, toucans, colies, bee-eaters, plantain-eaters, jacamars, and barbets.

Coccyzus. [Cuckoo.]

Cochabamba, a city of Bolivia, capital of department and province, in lat. 17° 27′ S., long. 64° 46′ W., on the banks of the La Rocha, a subtributary of the Rio Grande, 122 miles N.W. of Sucre, at a height of 8,370 feet above sea level. The city, which is a bishop's see, was founded in 1565, and was called Orapesa. It has broad streets and its one-storeyed houses are surrounded by gardens. The industries are woollen and cotton manufactures, and the preparation of leather, and making of soap, glass ware and pottery. The population is mostly Indian. The province, which occupies extensive upland plains among the offshoots of the E. Cordilleras, is poor in metals, but has fertile

valleys well fitted for agriculture and cattle-rearing. The climate is equable and healthy, but trade is hampered by want of roads.

Cochimi, a people of Lower California, whose original territory extended from the head of the Gulf of California to Loreto; two divisions, Laymon and Ika; speech quite distinct from all other native languages, though showing some slight affinity with the Yuma of Arizona. The Cochimi formerly roamed the northern plains now occupied by the Bocopas, by whom they were gradually driven west of the Colorado. They are a restless nomad people, continually shifting their camping grounds, seeking the shelter of rocks or brushwood, but building no habitations of any kind except, perhaps, a few dens or lairs for their sick. Formerly they even dispensed with all clothing, though fond of ornaments such as shell necklaces, bracelets, and feathery head-dresses. They are dying out.

Cochin. 1. A native state of India in the presidency of Madras, between lat. 9° 48′ and 10° 50′ N., and long. 76° 5′ and 76° 58′ E., having South Malabar and Coimbatore on the N.E. and W., the Indian Ocean on the W., and Travancore on the S. The state has an area of 1,361 square miles, and is divided into seven districts. Hemmed in between the sea and the Western Ghauts, it is well watered by numerous rivers which form lagoons and backwaters, which alternate between wide navigable sheets in the wet season—from June to December—and scattered shallows in the dry season. Rice is extensively grown, and there are remains of fine teak forests, which produce a considerable quantity of timber. Among other productions the chief are coffee, cotton, pepper, ginger, and spices. Besides the British port of Cochin, there are the trading ports of Malipuram and Narakel, the latter of which forms a port of shelter during the monsoons, where the British India Company's steamers touch during several months of the year instead of at Cochin.

2. A town of British India, on the South Malabar coast, at the north of a strip of land twelve miles long by an average of one mile broad, almost cut off from the mainland by inlets of the sea and backwaters of the river estuaries. In 1663 the Dutch captured it from the Portuguese and made it a very prosperous town; the English captured it in 1796 and the trade considerably declined. A bar obstructs the entry of the river, and renders it unsafe of approach during the monsoons. A lighthouse, visible at fifteen miles, marks the south entrance of the harbour. For ship-building and commerce Cochin ranks next after Bombay.

Cochin China, the eastern division of the Indo-Chinese peninsula, includes Anam proper, the French colony of Cochin China and Tong-King, and consists of a strip of land forming the arc of a circle, and extending about 1,240 miles along the E. coast, being bounded on the W. by a mountain chain, and varying in breadth from 372 miles in the N. of Tong-King to 50 miles in Hué and 190 miles in Lower Cochin China. The empire of Anam contains about 230,000 square miles, and the French Indo-China about 21,630, but the western boundary is vague, and many parts are unexplored. The country in the S. is low, flat, and alluvial, rising, however, to the height of 920 feet in Cape St. Jacques, at the entrance of the river Donnai, which leads to Saigon. The principal river of this part of the country is the Cambodia or Me-Kong, which has a delta of more than seventy miles in area. About 45 miles from the mouth of the Me-Kong is the island of Pulo Condore, with a good port, and a French penitentiary establishment, and the coast generally is studded with islands, some of which in the Gulf of Tong-King are the haunts of pirates. The chain of mountains which stretches for a long way down the west of the country is the last offshoot of the plateau of Thibet, but nowhere rises to a greater height than 5,250 feet. The principal river of Tong-King is the Hong-Kiang, upon which the capital Hanoi is situated. This river is very low in March, but becomes a torrent in July, and floods the country. The kingdom of Anam has many unimportant rivers, and most of the rivers of Southern Cochin China are connected by canals. The climate of Tong-King is healthy, but that of the French colony is particularly fatal to Europeans, dysentery being the most prevalent disease. The mean temperature of this part is 83° F., and the atmosphere is damp and depressing. The fauna is rich, and besides the timber forests, there are in parts abundant fruit-trees, from which one province—Vinhlong—obtains its name of the garden. The chief production is rice, next to which come cotton, mulberry, sugar-cane, maize, betel, and vegetables, and the cultivation of tea has been introduced. Tong-King is rich in metals, but Lower Cochin China is poor in minerals. The population of nearly two millions consists chiefly of Anamites, who present peculiarities which mark them off as a distinct race, Cambodians, Chinese, savages, and Malays. The French colony is connected by telegraph with Singapore, Tong-King, and Hong-Kong, and Saigon has a railway and steam tramways.

Cochin Chinese, the northern branch of the Annamese nation [ANAM], who at present occupy the region formerly held by the Chams. [CHAMS.]

Cochlea. [EAR.]

Cochrane, THE HON. SIR ALEXANDER FORESTER INGLIS, British naval officer, son of Thomas, Earl of Dundonald, was born in 1758, and, having entered the royal navy, was signal lieutenant to Sir G. B. Rodney in the action with M. de Guichen in 1780, and was on that occasion wounded. As captain of the *Thetis*, 42, he took part in 1795 in a very gallant and successful action with five French vessels; and as captain of the *Ajax*, 80, he accompanied, in 1800, the expeditions against Quiberon, Belleisle, and Ferrol, and shared in the subsequent debarkation of the army in Egypt. In 1802 he entered Parliament for the Stirling Burghs, but upon the renewal of the war in 1803 he returned to active service, and in 1804 became rear-admiral. From 1805 to 1810 he commanded-in-chief on the Leeward Islands station, participating in Sir John Duckworth's complete victory off St. Domingo and

in the reduction of St. Thomas, St. John, St. Croix, Martinique, and Guadeloupe. He had, in 1809, become a vice-admiral. In 1813 he was made commander-in-chief in North America, where, by forces under his orders, the coast was blockaded and Washington was destroyed. He came home in 1815, was promoted to be admiral in 1819, was port-admiral at Plymouth from 1821 to 1824, and died in 1832, being at the time a G.C.B.

Cochrane, Thomas, Lord Cochrane. [Dundonald.]

Cochrane, Sir Thomas John, eldest son of Admiral the Hon. Sir A. F. I. Cochrane, was born in 1789, entered the royal navy in 1796, and became a lieutenant in 1805, and a commander and captain in 1806, being then only seventeen. In the *Jason*, 32, he, in 1807, captured the *Favorite*, 29, and assisted in the reduction of the Danish West India islands. During the war of 1812 he served under his father with much distinction. Attaining the rank of rear-admiral in 1841, he became, in 1842, second in command in the East Indies, and in 1845 succeeded Sir William Parker as senior officer there. He during that period rendered to his country valuable services against the Borneo pirates. In 1850 he was made a vice-admiral, and in 1852 became port-admiral at Portsmouth. In 1856 he reached the rank of admiral; and at his death, in 1872, he was a G.C.B. and senior admiral of the fleet. Sir Thomas, who had been knighted in 1812, was, in 1839, returned to Parliament for the borough of Ipswich.

Cockade, which would be more correctly written *coearde*, denotes a badge, generally worn in the hat, to show the wearer's political or other views. The custom which is now so general of affixing a cockade to the hats of menservants is really no older than the present dynasty, and the cockade as now worn, which is known as the "black cockade of Hanover," signifies allegiance to the House of Hanover as such, though not necessarily as sovereigns of England. The cockade is purely a naval and military badge, and should only be worn by the servants of officers in the army, navy, militia, volunteers, or royal naval reserve, by sheriffs and lord-lieutenants of counties, and others holding military office; and it is a great pity that the privilege of using the mark of distinction is so sadly abused by civilians. The plain circular shape is the naval cockade, and that with a small fan-shaped projection rising above is the military form. A *white* cockade in "the days long since gone by" was the badge of allegiance to the Stuarts. but nowadays the use of coloured cockades is entirely confined to subjects of other sovereigns than ours.

Cockatiel, Cockateel, a dealers' name for *Calopsitta novæ-hollandiæ*, a small Australian cockatoo of sober plumage.

Cockatoo (Malay, *kakatua*, the cry of the bird), a popular name for any crested parrot. These birds are distinguished by a deep notch on each side of the cutting edge of the mandible, and form the family Cacatuidæ. They are very abundant in the Australian region, especially in its Austro-Malayan portion, but are not found farther east than the Solomon Islands, and are absent from New Zealand. The type-genus Cacatua, with eighteen species, ranges from the Philippines southward to Tasmania; Calyptorhynchus is confined to Australia and Tasmania; and Microglossus to North Australia and the Papuan district. The plumage of the last two genera is black. [Cockatiel, Parrot.]

Cockatrice. This creature, which, of course, is entirely imaginary, is depicted in heraldry as having the beak, head, comb, wattles, and legs of any ordinary cock, and the body, the wings, and the tail of a wyvern, *i.e.* its body is elongated and curled round, gradually diminishing in breadth until it ends in the barbed tail of the dragon. The wings are exactly as those of this latter animal, and are always shown to be elevated, whilst occasionally they are also expanded one on each side.

Cockburn, Sir Alexander (1802–1880), an English judge, was educated at Cambridge, and called to the bar in 1829. He soon obtained a good parliamentary practice, and in 1847 became Liberal member for Southampton. In 1850 he became Solicitor-General and was knighted; in 1856 he was made Chief Justice of the Common Pleas, and in 1859 Lord Chief Justice. As an advocate Sir Alexander was renowned for his eloquence, and was an acute and painstaking judge. His prosecution of Palmer—in which case he was opposed to Mr. Shee—will still be in the minds of some, as well as his connection with the Tichborne and Wainwright trials. He represented England at the Geneva Conference arising out of the Alabama case.

Cockburn, Mrs. Alison (1713–1795), a Scottish woman of letters, chiefly known as the writer of *The Flowers of the Forest* (1765). She was the daughter of Robert Rutherford, and in 1731 married an advocate, becoming a widow in 1753. She was a queen of Edinburgh society, and in 1777 foresaw the greatness of Scott, whose mother was her relative. In 1786 she made the acquaintance of Burns.

Cockburn, Sir George, British naval officer, born in London in 1772, entered the service in 1781, and, after his promotion to post-rank in 1794, greatly distinguished himself as captain of the *Meleager*, 32, *Minerve*, 42, *Phaeton*, 38, *Captain*, 74, and *Pompée*, 74, in each of which he was several times engaged, and made numerous prizes. In the last-named ship he, with a commodore's broad pennant flying, captured Martinique in 1809. He next commanded a division of small craft during the operations in the Scheldt, and subsequently a small expedition fitted out for the liberation and assistance of Ferdinand VII. of Spain. After much service he was, in 1812, made a rear-admiral, and hoisted his flag in the *Marlborough*, 74, as commander of the squadron destined for the defence of Cadiz; but, the siege having been raised before his arrival, he was ordered to North America. He reached the Chesapeake in March, 1813, and began

a desultory system of warfare, which, if it led to no great results, was exceedingly brilliant, and very harassing to the enemy. Both in the Potomac and in the Patuxent he carried everything before him. He co-operated with General Ross in the operations which led to the capture of Washington; he landed and took part in the profitless descent on Baltimore; he occupied St. Mary's; and so good a reputation did he create for himself that, upon his return to England, no one was deemed fitter than he to carry Napoleon to St. Helena, and to guard him there upon his arrival. In the *Northumberland*, 74, he sailed from Plymouth on August 8th, 1815, and on October 15th following he landed the Emperor upon his island prison. In the following year he was superseded and came home, and in 1819 he became a vice-admiral. From 1832 to 1836 he commanded on the North America and West India station; in 1837 he became an admiral; from 1841 to 1846 he was a Lord of the Admiralty; in 1851 he was made admiral of the fleet; in 1852 he was invested with a baronetcy; and in 1853 he died. He had been nominated a G.C.B. in 1818, elected a F.R.S. in 1820, and, with brief intermissions, he sat in Parliament for various constituencies from 1818 until nearly the close of his career. In 1827 he became a privy councillor.

Cockburn, HENRY (1779–1854), a Scottish judge, and man of letters, was born at Edinburgh, and educated at the High School and university of that town, and belonged to the debating society of which Scott, Brougham, and Jeffrey were members. He was called to the bar in 1800, and joined the Whig party, though all his surroundings were Tory. In 1830—with the accession of Earl Grey to power—he became Solicitor-General for Scotland, and four years later took his seat in the Court of Session as Lord Cockburn. In 1837 he was appointed Lord of Justiciary. His style of eloquence was clear, pathetic, and simple, and he was renowned for his powers of conversation. He was a considerable writer. The *Life of Lord Jeffrey* (1852), and the *Memorials of his Time* (1856), display great literary ability. He also wrote several pamphlets, and was an important contributor to the *Edinburgh Review*.

Cocker. [SPANIEL.]

Cocker, EDWARD (1631–1675), an engraver who taught writing and arithmetic, and was the author of the celebrated arithmetic, which gave rise to the expression "according to Cocker." This book has been condemned as a bad one which led to great deterioration among elementary books on the subject, and has been declared also to be a forgery, and not the work of Cocker at all. The same is said also of his English Dictionary. Pepys speaks of him in his diary as well-read in the poets.

Cockermouth, parliamentary borough and market town of Cumberland, 25 miles from Carlisle, and situate at the junction of the Cocker and the Derwent. There are coal mines in the neighbourhood, and linen and woollen goods, threads, hosiery, hats, and paper, are manufactured. In the eleventh-century castle Mary Stuart was imprisoned in 1568, and in 1648 the castle was dismantled by the Parliamentary forces. In the neighbourhood tumuli have been discovered, and there are the remains of a Roman camp. The town returns one member to Parliament. Wordsworth was born here.

Cock-fighting is an ancient British sport, now almost obsolete owing to legal enactments and the change of taste. The sport is to be met with as early as the time of Edward III., and remained popular for centuries, and gave rise to a special breed of birds, whose natural pugnacity was increased by selection and feeding. Few people now understand what it is to fight a main of cocks, or know what are the distinguishing features of a Welsh main; nor is the knowledge of these points of any great consequence. The Malays are passionately fond of cock-fighting.

Cock-lane Ghost, a story of a ghost which has had a false importance given to it by reason of being mixed up with Dr. Johnson. A certain man and his daughter occupied a house in Smithfield, in which the wife of a former tenant had died. Mysterious knockings were heard—afterwards discovered to have been produced by the daughter aforesaid—which declared in a manner well known to ghost hunters that the former tenant had murdered his wife, and this unfortunate man was much persecuted in consequence. Whether Dr. Johnson did or did not believe the story is of no consequence, especially as no one reads Churchill's clumsy satire upon him.

Cockle, an interesting name commonly applied to the caryophyllaceous cornfield weed *Agrostemma Githago*. In the Saxon version of St. Matthew's Gospel it occurs as "coccel," and in the Douai version as "cockle," where the Authorised Version has "tares." The word, which is also used by Chaucer and Spenser, does not occur in cognate Teutonic dialects; but there is a Gaelic form "cogall," and an etymological connection has been suggested with the British word "coch," red, in allusion to the pretty rose-red flower. De Candolle, however, considers the plant to have been unknown to the ancients in southern or western Europe, and, pointing out its abundantly spontaneous growth in Northern Russia and the name in Russian "kukael," and in Polish "kakol," as the source of the modern Greek "kŏkkŏlē," suggests a Slav origin for both plant and name. On these grounds its possible accidental introduction in the earliest days of our Russian commerce, under Alfred, has been suggested.

Cockle, a mollusc of the genus *Cardium*, and family *Cardiidæ*. The most common species, *C. edule*, is the familiar edible cockle.

Cockney, from a word originally meaning an egg, then perhaps a small egg (still popularly termed a cock's egg); hence the term came to be applied to a weak, squeamish child; from this arose the term "King of Cockneys" confused with King of Cockaigne, or London. Henry III. was alluded to as the King of Cockneie. Later it was

applied to Londoners born, that is, if they were born within the sound of Bow bells in Cheapside, and later still as an adjective to any distinct London peculiarity. But in these days of universal travelling and shifting populations the word carries no clear meaning.

Cockpit, the sunk arena in which cocks were "pitted" against each other. It is also used as the name of the part of a ship in which some of the junior officers lived, and whither in an engagement the wounded were carried to be dealt with by the surgeons. In Shakespeare's *Henry V.* the theatre is spoken of as a cockpit.

Cock of the Plains (*Centrocercus urophasianus*), a large American grouse, called also the Sage Cock from the fact that it feeds on Artemisia (wild sage), which gives a bitter flavour to the flesh.

Cock of the Rock, any bird of the South American passerine genus Rupicola, distinguished by an elevated crest extending from the neck forward so as to cover the nostrils. In the best known species (*R. crocea*), about the size of a pigeon, the plumage is of a brilliant orange-yellow in the adult male; that of females and immature males is dull yellowish-green, and in these birds the crest is smaller.

Cock of the Woods. [CAPERCAILZIE.]

Cocoa-nut, now often spelt COKER-NUT so as to avoid confusion with the seeds of the cacao (q.v.), is the "nut" or hard interior of the fruit (endocarp) of *Cocos nucifera*, the type of a small genus of palms. The cocoa-nut palm is apparently a native of the Indian Archipelago, but has been dispersed throughout the tropics from early times, flourishing especially near the sea. It has a cylindric stem reaching two feet in diameter, and from 60 to 100 feet in height; a crown of pinnate leaves, each 18 to 20 feet long, with a sheathing and fibrous base, and branching monœcious spadices 5 or 6 feet long in a tough spathe, succeeded by bunches of from ten to twenty fruits. These are about a foot long, six or eight inches across, three-sided, with a membranous epicarp, fibrous mesocarp, stony shell or endocarp, and one seed filling its cavity. The seed has a brown testa, fleshy perisperm, and a milky liquid endosperm. No tree of the tropics has so many uses, every part of it being employed, and in Southern India furnishing several of the chief necessaries of life. The wood of the outer part of the stem is used, under the name of *Porcupine wood*, for inlaying; the leaves for thatch, mats, hats, etc.; the fibrous mesocarp, under the name of *coir* (q.v.), for cordage, etc.; the shell or endocarp for bottles, cups, spoons, and, when properly burnt, for excellent charcoal and lamp-black. The perisperm or solid white kernel contains 36 per cent. of oil known as *copra oil*, from which, by pressure, the solid *stearine* used for candles is separated from the liquid lamp-oil. The "milk," when fresh, is an agreeable drink; and from the sap of the spadix sugar is obtained, and, by fermentation, *toddy*, from which vinegar and, by distillation, *arrack* are prepared. Cocoa-nut oil is imported in kegs of 1 cwt., barrels of 3 cwt., and hogsheads of 4 cwt. each; imports into Great Britain in 1890 exceeding 9,000 tons.

Coco-de-mer, or DOUBLE COCOA-NUT, the remarkable fruit of *Lodoicea sechellarum*, a palm restricted to the islands of Praslin and Curieuse in the Seychelles. The fruit was known as flotsam in the Maldive Islands, before the discovery in 1734 of the Seychelles, and was supposed to be of marine origin. It contains one, two or three bi-lobed nuts, with hard black shells like double cocoa-nuts, and weighs about 40 lbs.

Coconada, in the Madras presidency, about 300 miles from Madras, is a sea-port of the Godaveri district, and has an export trade in cotton, cigars, sugar, rice, and oil seeds.

Cod (*Gadus morrhua*), a well-known and valuable food-fish, type of the genus Gadus, from the Arctic and north temperate zones, containing eighteen species, having the body moderately elongated and covered with small scales; they have three dorsals, a separate caudal and two anal fins, and the ventrals, composed of at least six rays, are narrow; there are teeth on the upper jaw and vomer, but none on the palatine bones. To this genus also belong the bib, coal-fish, haddock, pollack, tom-cod, and whiting (all which see). The name is often extended to the whole anacanthinous family Gadidæ, in which the burbot, hake, ling, and torsk, also important food-fish, are comprised. The common cod-fish is from 2 feet to 4 feet in length, and sometimes attains a weight of 100 pounds, but specimens of from 60 to 70 pounds, with a length of about 3 feet, are much more common. Fish from the British coasts and North Sea are olive-brown above, with yellowish spots, and whitish beneath, and with dusky fins; farther north the hue becomes darker, and in fish from the Arctic coasts there is generally a dark blotch on the side. They are very voracious, and feed on worms, crustaceans, and small fishes. They are exceedingly prolific, and spawn in January round the British coasts, but much later on those of America. Cod-fishing has been systematically carried on for some three centuries on the banks of Newfoundland, and most of the preserved cod is of American production. The Dogger Bank is also a well-known fishing ground, and the cod-fishing industry is an important one on British coasts and on those of Iceland, Sweden, and Norway. The smoked roe and the sound, when salted, are esteemed as delicacies; the latter dried is sometimes used as a substitute for isinglass. [COD LIVER OIL.]

Cod Liver Oil, a valuable remedy in most forms of chronic disease in which wasting is a prominent symptom, and as a tonic during convalescence from acute disease. It is a particularly favourite remedy in all lung diseases attended by loss of flesh, in chronic rheumatism, and in scrofula. It is no use giving cod liver oil if it cannot be digested, and although it is more readily absorbed than other fats and oils are, it must fail to be of service where high fever is present. Again, the existence of diarrhœa is a contra-indication to its use.

Code (Lat. *codex*), a systematised collection of regulations or laws drawn up for convenience of reference, as, for example, a code of signals. The word is specially used to signify a condensed body of laws or procedure. The most famous codes have been those of Theodosius, Justinian, and Napoleon, the last of which is the basis of many modern legal systems, while the former two much modified the civil law, and through it the English, and especially the Scottish systems. No real effort has yet been made to codify English law. Austin seemed likely to be able to inaugurate one, but, besides the fact that he was a doctrinaire, his health prevented his attempting more than an outline of the way in which it should be done. So England remains almost alone among nations in having no code. Lord Macaulay and Sir James Fitzjames Stephen digested and codified the laws of our Indian Empire.

Codex (Lat. *a set of wooden tablets*, hence a book) is a term applied to any MS., but especially to any of the authentic MSS. of the Christian Gospels, which have been discovered in divers places and at various times. These discoveries have thrown valuable light on many critical points, and are of great interest to Biblical students. In France the Codex signifies an authorised body of medical formulæ.

Codicil (derived from the Latin word *codicillus*, *a little book or writing*) is an instrument made by a testator subsequently to his will, to which it is ancillary, and by which the dispositions contained in the will may be modified, cancelled, or otherwise altered. It is subject to the same rules as to execution and attestation as the will itself, of which it is considered to be a part, and the law regarding wills is in all respects the same as that affecting codicils. [WILLS.]

Codrington, SIR EDWARD, British naval commander, was born in 1770, and entered the royal navy in 1783 on board the yacht *Augusta*. Until promoted to be lieutenant in 1793, he served successively in North America, the Mediterranean, and the Channel. Subsequently he joined the *Queen Charlotte*, flagship of Earl Howe, and in her participated in the action of the Glorious First of June, 1794. In the following October he was made a commander, and in 1795 was posted to the *Babet*, 22, in which he was present at Lord Bridport's action off Ile de Groix. He was captain of the *Orion*, 74, at Trafalgar, and received, in consequence, the gold medal. In 1808 he was appointed to the *Blake*, 74, and in her served with the unfortunate expedition against Walcheren with great distinction, especially on the occasion of the forcing of the passage of the Scheldt. In the same vessel he rendered valuable assistance against the French in Spain, and, landing, did also good work ashore. He returned home in 1813, and was made a colonel of marines. Sailing soon afterwards for North America with a commodore's pennant in the *Forth*, 40, he was, in the summer of 1814, promoted to the rank of rear-admiral, and appointed captain of the fleet to Sir Alexander Cochrane in the *Tonnant*, 80. He was present at the capture and destruction of Washington, and then, hoisting his flag in the *Havannah*, 36, took part in the operations against New Orleans. In 1815 he was made a K.C.B., in 1821 vice-admiral, and in 1826 commander-in-chief in the Mediterranean, with his flag in the *Asia*, 84. He was the senior officer of the combined British, French, and Russian squadrons which, on October 20, 1827, destroyed the Turco-Egyptian fleet in the Bay of Navarino. As a reward he was made a G.C.B., but he would undoubtedly have received from King George far higher honour had there been in England more unanimity than existed as to the wisdom of the policy which he had been deputed to carry out. From foreign sovereigns he received the orders of St. Louis of France, St. George of Russia, and the Redeemer of Greece, but he was recalled in 1828. In 1831 he commanded a squadron of observation in the Channel, and having in 1837 reached the rank of admiral, was, in 1839, appointed commander-in-chief at Portsmouth. He relinquished this post in 1842, and never again hoisted his flag. Sir Edward, who was a G.C.M.G. and F.R.S., represented Devonport in Parliament from 1832 to 1840. By his wife, *née* Miss Jane Hall, he had, with other children, a son Henry John, who, after taking part in the attack on St. Jean d'Acre in 1840, also became an admiral, and died in 1877, at the age of 69, and a daughter, who married Sir Thomas Bourchier, R.N., and wrote her distinguished father's biography. Sir Edward, who was one of the last survivors of the Trafalgar captains, died in 1851.

Codrington, GENERAL SIR WILLIAM, son of Sir Edward (1804–1884), was commander-in-chief in the Crimea in 1855.

Codrus (11th century B.C.) was the last king of Athens. He was the son of Melanthus, and sacrificed his life for his country in a war between the Athenians and Dorians. An oracle had declared—unlike the oracle in Scott's *Lady of the Lake*—that the blood of the Athenian king would ensure victory to his side. So Codrus entered the Dorian camp disguised, and was slain in a quarrel with some of the enemy's soldiers. The title of king was abolished by the Athenians, who thought no one fit to hold it after him.

Coefficient, in *Algebra*, is the factor in a term by which the unknown quantity is multiplied. Thus in the terms $3x$, ax, the coefficients are 3 and a. The term *differential coefficient* is applied in the higher calculus to represent the rate of change of one quantity with regard to another on which it depends. [CALCULUS.] In physics the term is frequently used. The coefficient of linear expansion of a substance for temperature means the amount of expansion that unit length of the substance undergoes when its temperature increases from 0° to 1° C. Similarly for expansion of areas and volumes. In electrical engineering the temperature coefficient of a metal is the proportional increase in its resistance per degree rise in temperature.

Coehoorn, MENNO, BARON VAN, called the Dutch Vauban, was a military engineer, born in 1641, near Leeuwarden, the son of a captain of infantry. He

studied fortification at Franeker, and at the age of sixteen was already a captain. He distinguished himself upon many occasions, especially at the siege of Maestricht, and in 1673 he made use of the mortars which he had invented and which were called after him. Readers of *Roderick Random* will remember that these mortars formed part of the armament of one of the ships that Roderick was on board of. In 1692 he fortified Namur, and afterwards defended it against Vauban. In 1695 he retook the town. In 1701 he besieged and took many towns during the war of the Spanish succession, and finally died in 1704 at the Hague, where he had gone to consult with Marlborough upon the next campaign.

Cœliac Axis. An important branch of the great arterial trunk called the abdominal aorta. [Aorta.] It divides into three branches, which are severally concerned in supplying with blood the stomach, liver, and spleen.

Cœlome. [Body Cavity.]

Coercive Force, the older expression for magnetic resistance (q.v.). The terms magnetic reluctance, molecular rigidity, and magnetic inertia are also variously employed to express the same state—that of the resistance to magnetisation that iron exhibits when placed in a magnetic field, and its subsequent resistance to part with its magnetism when removed from the field. [Magnetism.]

Coffee, named from Caffa, one of the provinces of Abyssinia, of which the original coffee-shrub is a native, is the horny seed of shrubs belonging to the rubiaceous genus *Coffea*. They are shrubs or small trees of the tropics, with opposite glossy leaves, small sessile white flowers, and berry-like bi-carpellate fruits, resembling red cherries. The pulp and a parchment-like covering having been removed, the seeds or "beans," of which there are two in each fruit, are roasted, by which process a fragrant oil is produced. *Coffea arabica* was introduced from Abyssinia into Arabia early in the fifteenth century by Sheikh Djemaleddin-Ebn-Abou-Alfagger, and its use, in spite of opposition, soon became general. It reached Constantinople in the middle of the sixteenth century, and the first coffee-house in London was opened in 1652. The plant is now cultivated throughout the tropics, and we receive more from Central America than from any other country. The consumption of coffee in England has diminished from 1·23 lbs. per head in 1860 to ·82 lb. in 1890. This is partly due to the ravages of the coffee-leaf fungus (*Hemileia vastatrix*) in Ceylon, and of the moth (*Cemiostoma coffeellum*) in Dominica. *Coffea liberica*, a native of west equatorial Africa, is somewhat more robust than *C. arabica*, and since its introduction in 1876 has extensively replaced it. Coffee has a stimulant effect upon the circulatory and nervous systems owing to an aromatic oil and the alkaloid *caffeine* which it contains. The latter substance, closely identical with the theine in tea, occurs also in the leaves of the coffee-shrub, and in Sumatra they are infused instead of the berries. Chicory, acorns, and parsnips are among the common cheap adulterants of ground coffee. Imitation coffee-beans are manufactured from compressed meal in the United States, and a company was floated in England a few years ago for the preparation of coffee from date-stones.

Coffee-house now generally signifies a house of refreshment, where food is supplied, but no fermented or spirituous liquors. In the 18th century the coffee-house occupied much of the position now taken up by social clubs, and was the resort of poets, wits, and politicians, who went to drink their coffee and smoke their churchwarden. The Continental café seems to be difficult to introduce among us.

Coffer-dam, a casing of timber or iron fixed round the foundations of bridge-piers, sea and river walls, etc., during their construction, from the interior of which the water is removed, so that operations may go on below the water-level outside. It may be made of a double ring of wooden piers driven in side by side, the space between the two rows being filled up with clay or other impervious material. To resist the outside pressure of water, the interior of the coffer-dam is strongly stayed, and the piers are themselves well counter-braced. Stone may be used instead of timber, but sheet-iron casing is the more frequently employed. Wrought-iron caissons (q.v.) placed side by side, the joints between them being well caulked with felt or other such material, form a serviceable arrangement. The term is also applied to a water-tight compartment built into the side of a war-ship, and filled with some water-excluding material, so that, if projectiles enter the vessel, very little water follows through the aperture.

Coffer-fish, any individual of the Plectognathous genus Ostracion, with twenty-two species from tropical and sub-tropical seas. The body is enclosed in a kind of box made up of six-sided bony plates, and having openings for the fins and tail. [Globe-fish.]

Coffin (Gk. *kophinos*, a coffer or basket) is now generally used to denote the box in which the dead are enclosed for burial, and is in America called a casket. The form used generally in England is familiar to all. The coffin with raised roof, which one often sees abroad, is rarely met with in England. Though wood is the material generally employed, stone and metal have also been used, and there are many modern patents. Some are as eager as others are reluctant to return their bodies to mother earth; but even the stone coffin is at last taken from its occupant, and becomes the possession of an antiquary or of a museum. The name was also applied in old English to pie-crust; and in anatomy it denotes part of a horse's hoof.

Cognac, a French town, head of arrondissement in the department of Charente, on the left bank of the Charente, 32 miles W. of Angoulême, and 42 miles S.E. of Rochefort. There is an old castle upon a rocky height over the river, and a bronze statue of Francis I. marks his birthplace.

The district is chiefly noted for its vines and the manufacture of brandy, the distillation of which, together with the making of casks and bottles, is the chief industry of the town.

Cognovit, or "cognovit actionem," is the term applied to the document by which a defendant, on being sued, confesses the plaintiff's debt and suffers judgment to be entered against him. It is often adopted as a form of security for money, the course being for the debtor to execute a warrant to some solicitor named by the creditor, empowering him to enter judgment against the debtor in an action for a specific sum. It is subject to restrictive regulations, the most important being that it must be explained to the debtor by a solicitor specially appointed by him, who must attest his signature to the document.

Cogswell, Joseph Green, D.D. (1786–1871), an American bibliographer, born in Massachusetts, and educated at Harvard and Göttingen. He was professor of geology at Harvard (1820–23), and edited for a time the *New York Review*, and helped Halleck and Washington to plan the Astor Library, which he superintended for many years.

Cohesion, (1) the tendency for closely united particles to resist separation. The forces that keep the molecules of a body close together only act through very small distances. That is to say, if two particles are to exert a cohesive force on each other, their distance apart must be exceedingly small. Cohesion may be well observed in a soap film, or in a drop of water hanging from a glass rod. In the latter case we have the weight of the drop supported by a small area of water-particles. The term *adhesion* is similarly applied to the tendency for particles of different kinds to resist separation when once they are brought into close contact; it is instanced by the attraction between the water-particles and glass rod, in the case of the pendant drop previously mentioned.

(2) In *Botany*, cohesion means the union of similar organs, *e.g.* sepals to sepals, stamens to stamens, etc. In the flower apparent cohesion of the sepals, petals, filaments, or carpels is generally due to the intercalary growth of a zone of tissue below the whorl of organs which appear to cohere, carrying them up with it, and forming the so-called calyx-tube, corolla-tube, staminal-tube, or syncarpous ovary. The united (syngenesious) anthers of *Compositæ* are a case of true cohesion of originally distinct structures.

Cohoes, a manufacturing town in Albany Co., New York, on the Hudson, at the mouth of the Mohawk, and on the Erie Canal. It has cotton and knitting mills, and produces machinery, pins, and thread, among other things.

Cohort (Lat. *cohors*), in the Roman army, the tenth part of a legion. It then came to be applied in general to any body of soldiers consisting of the same arm, and might contain from 300 to 600 men. The word is used metaphorically—chiefly in poetry—and Byron tells us of the Assyrians' cohorts gleaming in purple and gold.

Coif (perhaps Ger. *kopf*), a covering for the head, sometimes a close cap used for the protection of the head from the weather, sometimes to prevent the chafing of a helmet or other head-mail. It became part of legal headdress, especially of sergeants-at-law, whose degree is sometimes called that of the coif. After the disuse of the coif proper and the adoption of the wig, a patch upon the top of the wig preserved the memory of the coif. The word also denotes a cap worn by elderly females in Scotland.

COIF.

Coils, Induction. [Induction.]

Coils, Resistance. [Resistance.]

Coimbatore, capital of a district in the Madras Presidency, on the Noyil, and 304 miles S.W. of Madras. It is a well-built and well-drained town, at a height of 1,437 ft. above the sea, and has a cool climate well suited to Europeans. The whole district of 7,432 sq. miles bears the same name as the capital, and produces cotton and tobacco, as well as timber from extensive teak forests.

Coimbra, a Portuguese city, capital of the province of Beira, situated on rising ground on the north bank of the Mondego, about 120 miles S.W. of Lisbon. The streets are steep, narrow, and dirty, and its chief products are earthenware and combs. It is of historical interest as being almost on the site of a Roman town, and was held by Goths and Moors successively, being finally taken from the latter by Fernando and the Cid in 1064. It was formerly the capital of Portugal. There are two cathedrals, a church of San Salvador, and a ruined convent. On the opposite side of the river is the Quinta das Lagrimas—or House of Tears—where Inez de Castro is said to have been murdered. Coimbra contains the only Portuguese university, removed from Lisbon in 1537, which has five faculties, with museum, observatory, botanic garden, and library.

Coina, a Spanish town in the province of Malaga, and 20 miles from the town of that name. It has an episcopal palace and two large churches, and there are marble quarries in the neighbourhood.

Coining, the stamping of metal with certain marks, giving it an ascertained current value. It is in most states the prerogative of the sovereign who (as the arbiter of domestic commerce) gives the authority which makes the coin current. By a statute of the present reign (24 and 25 Vic., c. 99) it is made a felony to counterfeit coin, to colour or gild, so as to make a resemblance to gold or silver coin, to impair or lighten coin, to have in unlawful possession filings or chippings produced by impairing or lightening coin, to buy or sell, or import or utter counterfeit coin. There are numerous other provisions in the above Act for the suppression of the manufacturing, importing, and uttering counterfeit coin. By another Act, also of the present reign

(the 33 and 34 Vic., c. 10), the laws relating to the coinage and Her Majesty's mint are consolidated and amended, and the standard of all coins is fixed, as specified in the first schedule. [TENDER.]

Coir, the short fibre from the husk (mesocarp) of the cocoa-nut (q.v.), which Britain imports mainly from Ceylon, for the manufacture of matting, ships' cables, cordage, brooms, clothes-brushes, etc., and as a substitute for horsehair in stuffing mattresses. In 1889 Ceylon exported 6,700 tons.

Coire (COIRA, CUERA, CHUR), the Roman *Curia Rhætorum*, is the capital of the Swiss canton of the Grisons, in the Upper Rhone valley, on a fertile plain in the valley of the Plessur, and about a mile and a half from the confluence of the Plessur and the Rhone, lying beneath the Mittenberg and the Pizokelberg. The chief occupation of the inhabitants is the transit trade between Germany and Italy, but there are also cotton, woollen, leather, and pewter manufactures, as well as dye-works and breweries, and some trade in cattle and corn. The bishop's palace and the Catholic quarter occupy a height separated from the rest of the town by walls and gates. The eighth-century cathedral of St. Lucius contains the bones of that ancient British king, and has some good paintings and old carving. The town is upon the road to Italy over the Splügen Pass, and is frequented by tourists. The Romanisch language is spoken there.

Coke. When coal is heated without access of air, gases are evolved and a residue, *coke*, remains, consisting chiefly of carbon together with the earthy impurities of the coal. It varies in colour from black to grey, and also in density. It burns with a clear non-sooty flame, giving out great heat. It is therefore very largely used in metallurgical processes. As the coke from gas-works is denser than that required for metallurgical furnaces it is frequently prepared by *coking*, either simply in piles of lump coal partially covered by small, or in specially constructed kilns or coke ovens. On the Continent it is in general usage as a fuel for ordinary domestic purposes.

Coke, SIR EDWARD (1552–1634), a great English lawyer, born at Mileham in Norfolk, and educated at Norwich grammar school and at Trinity College, Cambridge, and then at Clifford's Inn and the Inner Temple. In 1578 he was called to the bar, and his extensive and accurate knowledge brought him a large practice. In 1585 he became Recorder of Coventry, and entered Parliament in 1589 as member for Aldborough. In 1592 he was Solicitor-General, in 1593 Speaker, in 1594 Attorney-General, in 1606 Chief Justice of Common Pleas, and in 1613 Lord Chief Justice and Privy Councillor. In 1581 he had married a wife who brought him a fortune, and shortly after he married, as second wife, the daughter of Lord Burghley and grand-daughter of the great Cecil. In this marriage Bacon was his rival, as he was also in his professional career. Coke was harsh in his conduct of trials as Crown prosecutor, notably in the case of Raleigh, but he was a good judge as times went, and always defended the common law against the encroachments of the Court of Chancery and other interferences. In 1617 he was removed from the Bench for resisting the king's wishes, and in 1620 he entered Parliament as member for Liskeard. He became a leader of the popular party, and in 1621 was sent to the Tower for his share in the petition to the king. He was in the first and second Parliaments of Charles I., and in 1628 he had a great share in drawing up the Petition of Right. The last few years of his life were spent in retirement and in the revision of his works, the best known of which are his Institutes—one of which is called *Coke upon Littleton*—and his *Reports*.

Coke, THOMAS (1747–1814), Methodist bishop and missionary, was educated at Oxford, where he proceeded to the degree of D.C.L. in 1775. Ordained to a curacy in Somersetshire, he was dismissed by his rector for open-air preaching, and joined the Methodists. In 1784 Wesley made him superintendent of the American societies, and he made many voyages to America, and caused much hostility by his opposition to the slave trade. In 1797 and 1805 he was President of the London Conference, and it was on a missionary voyage to Ceylon that he died. Among his published works are extracts from his *American Journals*, a *History of the West Indies*, and—in collaboration with Henry Moore—a *Life of Wesley*.

Co-latitude of any point on the earth's surface is the angle between the vertical at that point and the axis of the earth. It is therefore the complement of the latitude, *i.e.* the difference between 90° and the latitude of the place. Thus the *co-latitude* of the north-pole is 0°, of London about $38\frac{1}{2}°$, and of any point on the equator 90°. [LATITUDE.]

Colberg (KOLBERG), a fortified Prussian seaport and watering-place in the old province of Pomerania and on the Persante about a mile above the point where it flows into the Baltic. It is about 170 miles from Berlin, is situated on a hill, and has three suburbs. A considerable number of people visit it for bathing, both in summer and winter. Among its public buildings is the fourteenth-century cathedral of St. Mary—one of the most remarkable churches in Pomerania. There are manufactures of woollen goods, spirits, and agricultural machines, and the salmon and lamprey fisheries are important. There is a large salt-mine in the neighbourhood. Colberg has often been besieged, the last occasion being its siege by the French in 1807.

Colbert, JEAN BAPTISTE (1619–1683), a French statesman, born at Rheims, where his father was a merchant. Able and ambitious, and withal unscrupulous, he obtained a post in the war office at twenty, and became the private secretary of Le Tellier, the secretary for war, who was a connection by marriage. In 1647 he received the confiscated goods of an uncle; in 1648 he married a rich wife, and in 1649 he became a councillor of state. When Mazarin was driven from Paris in 1651 by the influence of the Condé faction, Colbert was the appointed agent to keep the Cardinal posted upon what passed in Paris, and made use of his position

not only to obtain rich rewards and appointments for himself and his family, but also to gain the confidence of Mazarin, who entrusted him with affairs of great moment. Colbert was already forming his ideas of financial reform, and drew up a memorial to Mazarin, setting forth the fact that only a small proportion of the taxes reached the king, and drawing attention to the extortions of the superintendent Fouquet, who was his own nominee. Fouquet discovered Colbert's action, and became his bitter enemy in consequence. Upon the death of Mazarin in 1661 Colbert came into great prominence, and in nine years was supreme in all but war. His first idea was to bring about a financial and fiscal reform as the first step to restoring the country's greatness, and in this he was seconded by the young king, Louis XIV. The first step was to arrest Fouquet, who was banished; the next to punish the defaulting officers and fraudulent creditors of the State, and to vest the control of finances in a royal council with the king as president, but of which Colbert was the moving spirit. He introduced many reforms in taxation, protected industry and encouraged inventors, and gave a great impetus to foreign trade. His elaborate regulation of processes of manufacture, however, was much resented by the commercial world, and his policy stimulated that "individualist" reaction against government interference which is seen in the economic literature, French and English, of the last century. But his greatest achievement was to establish the French marine both of war and of commerce, and he was not very scrupulous as to the means he employed to bring about his ends. He also did much to advance art, literature, and science, and as superintendent of public buildings did much to improve and beautify Paris. He did not, meantime, neglect his own interests, and he died a millionaire. But all his efforts were neutralised by the vast demands for money to carry on the king's wars, and a few years after relieving the country of some of its taxes, he was obliged to heap on more; and the king's favour for his great rival, Louvois, is said to have had much to do with bringing him to a comparatively early death.

Colburn, ZERAH (1804–1840), a young American of Vermont, who at the age of six displayed such powers as a calculating boy that his father exhibited him in America, Great Britain, and France. He was put to school at Westminster, and after his father's death in 1824 he returned to America, where he was a Methodist preacher for nine years. He was appointed professor of languages in Norwich University, Vermont, in 1835.

Colchester, a municipal and parliamentary borough of Essex, on the right bank of the Colne, 12 miles from the sea and 51 miles from London. Three bridges cross the river. The town forms an oblong upon the ridge and sides of a promontory, called the Hythe, which stretches down to the river and forms the port. Colchester owes much of its importance to the fact of its being the natural port and outlet of a great corn-growing district, and to its oyster fishery which has belonged to the corporation from the time of the Norman conquest, if not longer, though the fishery is not now so important as formerly. There was formerly much manufacture of baize and serge, an industry introduced by the Dutch refugees, but this trade has died out, its place having partly been taken by the manufacture of silk. Colchester is a town of much historic interest. It was the British town of King Cunobelin, and then the Roman colony, Camulodunum. Roman remains are abundant in the neighbourhood, and some of the walls date from this period. It was also an important place in the Middle Ages. In Edward III.'s reign it provided five ships and 140 sailors for the siege of Calais. It was besieged and captured by Fairfax in 1648, and the castle was dismantled. The castle keep is the largest example of Norman architecture of the kind existing in England, its area being double that of the White Tower of London.

Colchester, CHARLES ABBOT, LORD (1757–1829), an English member of Parliament and Speaker of the House of Commons. He was the son of the rector of Colchester and half-brother of Jeremy Bentham. He was educated at Westminster and Christ Church, and he gained at Oxford the Chancellor's medal and the Vinerian scholarship. He practised at the bar for a few years, and in 1795 received a post in the King's Bench. In the same year he was returned to Parliament for Helston. He soon became noted as a parliamentary reformer, and was the chief cause of the taking of the first census in 1801. In that year he became Chief Secretary for Ireland, and in the next year he was chosen Speaker, a post which he held till compelled by illness to retire in 1817. He was raised to the peerage in response to an address of the House of Commons.

Colchicum autumnale, the so-called meadow saffron, or autumn crocus, is a British plant belonging to the *Melanthaceæ*, and so differing from the crocus, which it resembles externally, in having a superior (though subterranean) ovary and six stamens. It grows abundantly in limestone pastures in the west of England, and is also collected for pharmaceutical purposes in Germany. It has a solid bulb, bearing in spring broadish leaves, like those of the tulip, which die down in summer. The flowers, which are white or pale violet, coming in autumn without leaves, are known colloquially as "naked ladies." After flowering, the stalk bearing the capsule lengthens. Colchicum is employed medicinally in the treatment of acute gout. In suitable cases it gives speedy relief, but, unfortunately, it is not of such certain efficacy where the disease has become chronic. Colchicum is an intestinal irritant and produces vomiting and purging when given in full doses. It is either given in the form of tincture or of vinum colchici, or one of the two pharmacopœial extracts is made up with other ingredients into the form of a pill.

Colchis, in ancient geography, a district of Asia Minor at the E. end of the Black Sea, and lying just S. of the Caucasus. It is first spoken of by name by Pindar and Æschylus, and was in mythology the home of Medea and of sorcery, and

the object sought for by the Argonauts who went to find the golden fleece. It afterwards came into the power of Mithridates, and upon his defeat by Pompey it became a Roman province, afterwards incorporated with Pontus. Its inhabitants presented such a variety of type and nationality that all sorts of theories—none quite satisfactory—were started to account for their presence.

Colcothar is the residue obtained when ferrous sulphate or copperas is heated for the production of fuming sulphuric acid. It consists of red oxide of iron (Fe_2O_3), and is employed for polishing stones, etc., and a pigment. It is also known by the name of *caput mortuum*.

Cold. [CATARRH.]

Cold, the absence of heat. No body is absolutely cold; it must contain a certain amount of heat. The degree of cold is usually measured by thermometry, that is, by noting its temperature. The sensation of cold that a body may give is only estimated relatively, by comparison with its surroundings and with the human body. If when left to itself it gives out less heat than it receives, it is said to be colder than its surroundings. The second law of thermodynamics states that heat cannot pass from a colder to a hotter body without employment of external energy to effect the transfer. It is not that the coldest body in a system does not radiate heat out from itself, but it receives more than it gives, and the exchange is in effect the same as if cold were existent and were radiated from the body. [HEAT, THEORY OF EXCHANGES.] Varying degrees of cold may be obtained by the use of certain mixtures, generally termed *freezing-mixtures* (q.v.). Thus, if equal parts of ammonium-nitrate and water be mixed together a lowering of temperature to the extent of 26° C. may be effected. About the same effect is produced by mixing five parts of snow or pounded ice with two parts of common salt. The rapid evaporation of liquid carbonic acid or of sulphurous acid will also greatly lower the temperature of bodies in the immediate neighbourhood.

Coldstream Guards, otherwise called "Coldstreamers," a regiment of the Foot Guards originally raised by Monk, when he was general in Scotland in 1660. The Coldstream Guards have a red plume in the bearskin, a white band to the forage-cap, and their tunic-buttons are arranged in groups of two.

Cole, VICAT, an English landscape painter, born at Plymouth in 1833, and painting especially Surrey scenes. He began to exhibit at the Royal Academy in 1853, was A.R.A. in 1870, and R.A. 1880.

Colebrooke, HENRY THOMAS (1765–1837), an English Oriental scholar, born in London, received his early education at home. From the age of 12 to 15 he resided in France, and was appointed to a writership in India in 1782. Three years later he took a situation in the revenue department at Tirhoot, and devoted much of his time to Eastern science and literature. In 1789 he was removed to Purneah, and he soon after published *Remarks on the Husbandry and Commerce of Bengal*, advocating free-trade between Great Britain and India. He published a Sanscrit grammar and dictionary, and read many valuable papers to the Asiatic Society, of which he was a director.

Colenso, JOHN WILLIAM, D.D. (1814–1883), an English clergyman, writer on mathematics, and colonial bishop. Born at St. Austell in Cornwall, he was educated at St. John's College, Cambridge. He was second wrangler, and was then elected fellow of his college. For four years he was a master at Harrow, and then for four years tutor at Cambridge, and in 1846 he was appointed rector of Forncett St. Mary. The same year saw him appointed Bishop of Natal, where he gave himself vigorously to the study of the Zulu character and language, and translated into Zulu and printed the Prayer-book and parts of the Bible. His objection to the doctrine of eternal punishment expressed in 1861, and his calling in question the accuracy and authenticity of the Mosaic books in 1862 and 1863, brought about his condemnation by the ecclesiastical authorities and his deposition from his see by his Metropolitan, Bishop Gray, of Capetown. On appeal, the Privy Council declared the deposition null and void, and the Master of the Rolls declared him entitled to his income, which had been refused him by the Colonial Bishoprics' Fund. In 1869 Bishop Gray excommunicated him, and consecrated a Bishop of Maritzburg. In 1874 Bishop Colenso visited England to consult over his position, and to plead the cause of the Zulus as against the Boers, and on his return to Africa did all that was in his power to prevent the Zulu war. He died at Durban. Besides his theological works, he wrote *Ten Weeks in Natal*, and his books of arithmetic and algebra are still textbooks.

Coleoptera. The order of Insects including those forms in which the anterior wings are hardened into a pair of horny sheaths, which protect the soft hinder flying wings; the former are known as the *elytra*. The Coleoptera is numerically by far the largest of the orders of Insects, and includes more than 100,000 species. These are generally known as beetles; but this name is very loosely applied, including many forms, such as the Black beetles, which are not true Coleoptera, and excluding many groups, such as the Turnip Fleas, which really belong here. Among other characters that separate the Coleoptera from the other orders of Insects, in addition to their wings, are the following: (1) The mouth parts are adapted for biting instead of sucking; (2) and the metamorphosis is complete, *i.e.* between the adult flying stage and the larval grub stage there intervenes a period of rest, during which the insect is enclosed in a pupa. These three stages correspond to the caterpillar, chrysalis, and butterfly stages of the butterflies and moths. These characters enable us to assign to the Coleoptera certain insects which have lost their wings, or in which these are rudimentary, often being concealed beneath the two elytra, which have fused together. For an account of the anatomy of a type of this order *see* STAG-BEETLE. The Coleoptera have a very varied mode of life. Many are aquatic, such

as the Whirligig Beetles (*Gyrinidæ*) and *Dytiscus*: the larvæ of the latter are known as "fresh-water shrimps." Others are parasitic; and others, like the Cockchafers, at least in the larval stage, live on the roots of plants, to which they may do serious damage. A large number lay their eggs in dung, and upon this the larvæ feed. In the Weevils the eggs are placed in the kernel of a nut, through the shell of which the grubs bore their way at the end of larval life. The Bacon Beetles (*Dermestus*) lay their eggs in bacon, in which the larvæ live. The largest of the British species is the Stag-Beetle. [Glow-worms, Weevils, Cockchafers, Lady-birds, Devil's Coach Horse.]

Colepepper, John, an English cavalier and statesman of the 17th century. Born in Sussex, and entering upon foreign service, he was returned to Parliament in 1640 for Kent. Two years later he was Chancellor of the Exchequer, in the next year Master of the Rolls, and in 1664 Lord Colepepper. He was alive at the Restoration.

Coleraine, a municipal borough, county town and seaport of the county Londonderry, on the Bann, four miles from its mouth, and 145 miles north of Dublin. A stone bridge of three arches over the Bann joins the two parts of the town. The town has two parish churches, two Catholic churches, and several schools. The chief industry is the manufacture of linen, one special kind of cloth taking its name from Coleraine. Pork curing and eel and salmon fisheries are also carried on. At Portrush a harbour is formed by two piers, and there is a considerable trade.

Coleridge, Hartley (1796–1849), an English man of letters, the son of the poet S. T. Coleridge. Born at Clevedon in Somerset, he passed his early years at Keswick, where he was in company with his father, Wordsworth, De Quincey, and Professor Wilson. He went to Oxford in 1815, and there displayed much of his father's great powers as well as his weakness of purpose. His want of early discipline led him to succumb to the temptations of university life and to take to drinking. Elected a Fellow of Oriel, he lost his fellowship during his probationary year, and being presented by the authorities with £300, he came to London for three years. and wrote short poems for the London magazines. He next tried for five years to carry on a school at Ambleside. This proving a failure he retired to Grasmere, and passed the rest of his life in literary work, much beloved for his many charming qualities by all about him, whose affection for the man was proof against his weaknesses. He wrote *Essays* for *Blackwood*, *Lives of Northern Worthies*, and in 1839 *The Life of Massinger*, his last work. His prose style is good, and of his poems, in which Wordsworth's influence is to be traced. the best are his *Sonnets*, and an unfinished lyric drama, *Prometheus*.

Coleridge, John Duke, Lord, an English lawyer. son of Sir J. T. Coleridge, was born in 1821. Educated at Eton, and at Oxford where he was made Fellow of Exeter College. he was called to the bar, and practised on the Western Circuit, of which he became leader. In 1855 he became Recorder of Portsmouth, took silk in 1861, and represented Exeter in Parliament from 1865 till his appointment as Chief Justice of the Common Pleas, and Baron Coleridge. He was Solicitor-General in 1868, and Attorney-General in 1871. In 1880 he was made Lord Chief Justice of England. Of great eloquence as an advocate, most people remember him as the cross-examiner of the claimant in the Tichborne case.

Coleridge, Sir John Taylor (1790–1876), an English judge, nephew of the poet, born at Tiverton, and contemporary with Arnold and Keble at Corpus Christi College, Oxford. After a brilliant undergraduate career, he became Fellow of Exeter, and was called to the bar in 1819, practising on the Western Circuit. In 1824 he edited the *Quarterly Review* for a year, and in the next year published his edition of *Blackstone's Commentaries*. In 1832 he became Serjeant, and in 1835 a judge of King's Bench, a post which he retained till 1858, when he was made Privy Councillor. In 1869 he wrote a *Memoir of the Rev. John Keble*.

Coleridge, Samuel Taylor, poet, philosopher, theologian, critic, and journalist, was born on Oct. 21, 1772, at Ottery St. Mary, Devon, the youngest of ten children of the Rev. John Coleridge, vicar of the parish, and head master of King Henry the Eighth's free grammar school. Until his father's sudden death, in his ninth year, he was educated at home; in the following year, on July 18, 1782, he was entered at Christ's Hospital, where he remained eight years, entering Jesus College, Cambridge, early in 1791. Before going to Cambridge he had been smitten with the idea of becoming a surgeon, and read a vast number of books on surgery; then he had immersed himself in metaphysics, until in his eighteenth or nineteenth year he was won from philosophy to poetry by Bowles's sonnets. This "long and blessed" interval lasted for some ten or twelve years. His discursive mind, however, was even during this period much occupied by other subjects as well, particularly politics and theology, in both of which he was in those days an ardent Liberal. In 1793, under stress of pecuniary difficulties, he found his way to London, and enlisted as a private in the 15th Light Dragoons, under the name—which preserved his initials—of Silas Tomkyns Cumberbach. His scholarship, however, betrayed him, and within about four months he was bought out, and went back to Cambridge, where in the ensuing year he made himself known as a poet by publishing *The Fall of Robespierre*. Before this time he had gone with Southey to Bristol on a visit to the latter's aunt, and, being introduced to the family of a Bristol sugar-maker, named Fricker, had become engaged to one of the daughters, Sara, whom he married on Oct. 4, 1795. Another of the sisters became the wife of Southey, a third was already at the time of the Bristol visit married to their common friend Lovell (a Quaker), and a fourth refused Burnett, another of their friends. Between them the little band of enthusiasts formed the design of emigrating to the banks of the Susquehanna,

in America, there to form a communistic society to be known among men as a "pantisocracy." The scheme never came to anything, and Coleridge took up his temporary abode in a cottage at Clevedon, Somerset, selling a volume of poems to Joseph Cottle, the Bristol bookseller, for thirty guineas, and delivering a course of political lectures. In 1796 he started a weekly miscellany under the title of *The Watchman*, himself canvassing for subscribers: but the paper had soon to be abandoned. He then (1797) lived for a time with his friend Thomas Poole at Nether Stowey, in a cottage placed at his service by another friend, Charles Lloyd, son of a Birmingham banker. While at Nether Stowey he wrote, under the title of *Osorio*, the drama long afterwards published as *Remorse*. Ultimately accepted at Drury Lane, on Byron's recommendation, it was produced there on Jan. 23, 1813, and was for those days a success, having a run of twenty nights. He also wrote another drama, *Zapolya*, which was published in 1818, but never acted. *The Ancient Mariner*, which appeared in the first volume of the *Lyrical Poems* (1798), was begun in collaboration with Wordsworth, who, however, contributed to it little beyond the idea of the albatross. *Christabel* was commenced about the same time, but did not see the light for eighteen years, and then only as a fragment. In January, 1798, Coleridge, who had from his early years been a singularly profuse and impressive talker, undertook a Unitarian pastorate at Shrewsbury, but speedily abandoned it at the instance of the Wedgwoods, sons of the potter, who gave him an annuity of £150 that he might devote himself to poetry and philosophy. His work as a poet, however, was nearly over, for he did little afterwards in this kind but lament his failing powers. After a visit to Germany in 1798–99 with the Wordsworths, one result of which was his translation of Schiller's *Wallenstein*, he stayed for a while in London, and did a good deal of excellent work for the *Morning Post*. In 1800 he made his home at Greta Hall, Keswick, and there, by taking the "Kendal black drop" as a remedy for rheumatic and neuralgic pains which were the consequence of reckless bathing in the New River in his Bluecoat School days, began to contract the habit of opium eating. In April, 1804, he went to Malta for the benefit of his health, and for rather more than a year was secretary to the Governor, Sir Alexander Ball. Returning to England, he migrated from place to place, delivered a series of lectures at the Royal Institution on Poetry and the Fine Arts in 1808, started a new weekly paper, *The Friend*, in August, 1809, and had to give it up in March, 1810; delivered another series of lectures in 1811 and 1812; and in 1816, his home being already broken up, entered the family of Mr. Gillman, a surgeon at Highgate, in order that he might be restrained from the indulgence which had long been the bane of his life. Here he remained until his death on July 25, 1834, never quite secure from his besetting temptation, though seldom succumbing to it. While at Highgate his fame as an unrivalled monologist drew to him most of the men of genius of the day, among them Carlyle, whose impressions of "the most surprising talker extant in this world," recorded in his *Life of Sterling*, are wrought into one of the most vivid and life-like of his portraits. After Coleridge's death, his friend, Mr. Joseph Henry Green, an eminent surgeon and Fellow of the Royal Society, who had had much intercourse with him at Highgate, set himself to systematise and develop his philosophy, giving to the task the remaining thirty years or so of his life, and leaving behind him in MS. the work published in 1865 as *Spiritual Philosophy: founded on the Teaching of the late Samuel Taylor Coleridge*. In addition to the works of Coleridge already named, he published *The Statesman's Manual* in 1816, *Sybilline Leaves* and *Biographia Literaria* in 1817, and *Aids to Reflection* in 1825. Four volumes of *Literary Remains* appeared posthumously in 1836-38, *Confessions of an Enquiring Spirit* in 1840, and an *Essay on Method* in 1845. As a poet, slender and fragmentary as was his work, Coleridge showed forth qualities of the highest order, which, had they been allied with stronger character, might have placed him in the same rank with Wordsworth. His inconsequence as a philosopher and theologian admits of the same explanation. As a journalist he has had the unstinted admiration of competent judges. But it was as a critic of poetry and the drama that he came nearest to doing himself justice. He was just in time to save his country from having to learn the supreme greatness of Shakspeare from a German; his separation of the great from the little in Wordsworth is final and conclusive; his formulation of the laws of poetry is the luminous and convincing work of one who was at once poet, philosopher, and critic. Altogether he was, without controversy, the most profusely gifted, if the least effectual, genius of a great generation.

Coles, Cowper Phipps (1819–1870), an English naval architect, was born in 1819, entered the navy and became captain in 1856. He was the great advocate and in part inventor of the turret ship. The *Captain*—a turret-ship built from his designs—was commissioned in 1870, and on the 7th of September of that year capsized in a gale off Cape Finisterre, Captain Coles himself and almost all on board being drowned. A tablet in St. Paul's commemorates this event and gives the names of those lost.

Colet, John (1466–1519), a celebrated Dean of St. Paul's, and friend of Erasmus. Born in London, he was educated at St. Anthony's school, and at Magdalen College, Oxford, where he studied especially logic and philosophy. In 1493 he went to Paris and to Italy to perfect himself in Greek and Latin. He was ordained on his return to England in 1497, and in 1505 he was made first prebendary and then Dean of St. Paul's. He established a divinity lecture on three days in the week at St. Paul's, and in 1512 founded and endowed St. Paul's School, of which the Mercers' Company were made trustees, and William Lilly the first master. His views were so much in advance of those of his colleagues upon many points that he was looked on as little better than a heretic, and was so molested

that he determined to retire, but died before doing so. He wrote a great number of works, chiefly on theological subjects, but among them were *Letters to Erasmus*, and *Rudiments of Grammar*.

Colfax, SCHUYLER (1823–1885), an American jonrnalist and politician, born at New York. In 1845 he acquired a newspaper in Indiana and made it an influential Whig journal. From 1854 till 1869 he was a Republican member of Congress, and was three times chosen Speaker. He was chosen Vice President of the United States in 1868, but, being implicated in certain political charges in 1873, he retired into private life.

Colibri, the French name for a Humming-bird (q.v.).

Colic, or intestinal pain, is a symptom which may arise from the most trivial or the most grave and serious causes. The frequent occurrence of griping pains in the abdomen, causes colic to be looked upon by the public as quite a simple disorder eminently suited for domestic practice, and yet there is perhaps no symptom which the physician is inclined to treat with greater respect. Spasm of the muscular coat of the intestines may be set up by so prosaic a cause as the taking of some article of food which disagrees, as the phrase is, with the patient; or it may form a striking feature in that most alarming of conditions which is known to medical men as intestinal obstruction. In the former case a purge soon removes the source of trouble, in the latter this form of treatment is more fraught with danger to the patient than any plan of action which could be devised. In dealing with colic, therefore, it is most necessary to study carefully the whole of the phenomena present in each individual case, and not to imagine that any particular plan of treatment will comprehend all the multifarious forms of disease which are associated with abdominal pain. The pain of colic is often referred to the navel, or it may shift about from one part of the abdomen to another; it is usually not aggravated by pressure. Pain originating in parts within the abdomen other than the intestines may closely simulate true intestinal colic. Thus the site of trouble may be the stomach, or the pain may be due to gall-stone, renal calculus, vertebral disease, uterine disorders, aneurism, or peritonitis. In the common and familiar colic, consecutive to the swallowing of something which disagrees, diarrhœa (q.v.) is usually present. Colic is often associated, too, with constipation (independent of any actual obstruction), particularly in women of middle age. Again in lead poisoning [LEAD], whether in painters, or arising from drinking water which contains lead as an impurity, colic is a prominent symptom. Again, colic may be nervous in origin, a low state of health manifesting itself in some persons as colic, just as it does in others as neuralgia or megrim. In intestinal obstruction [INTESTINE] there are usually present, in addition to pain, constipation and vomiting. It sometimes falls to the lot of the physician to discover, on examination of the abdomen in "colic," such conditions as typhlitis (q.v.) or strangulated hernia. [HERNIA.] The treatment of colic is, it will be gathered from what has been said, best conducted on very simple lines. Pain is often relieved by the application of warmth in the form of a poultice or of hot flannels, or in children of a warm bath. Opium, or castor oil and opium, are invaluable in certain cases; the difficulty is to know which the cases are, hence their administration had far better be left to the medical man. Opium is, of course, especially to be avoided in the case of children. Strong purgatives should on no account be given save under professional advice. There is less objection to an enema; indeed, the treatment by the use of an injection is very useful in many cases of colic. In all instances, however, where abdominal pain persists unrelieved by the simplest measures, the best plan is to go for the doctor.

Coligny, GASPARD DE (1517–1572), a French admiral. Born at Chatillon, he came to court in 1539 and became the friend of Francis of Guise. He took part in the campaign of 1543, and was twice wounded, and was knighted on the field of battle during the Italian campaign of 1544. He took part in several other campaigns, and was made admiral. In 1554 a quarrel between Francis and Coligny broke out, and after Coligny's conversion to Huguenot views a little later this quarrel was changed to open and violent hostility. In 1562 the Civil war began, but the assassination of Francis in 1563 led to the maintenance of peace for some years. After another outbreak of war with various results, from 1567 to 1570, peace was again concluded and Coligny returned to court, where he rose into favour with Charles IX. He proposed to the king a descent on Spanish Flanders with a joint army of Catholics and Huguenots to be led by the king, and this proposal so alarmed the queen-mother that she determined on the massacre of St. Bartholomew. On the 22nd of August, 1572, Coligny was shot at and wounded in the streets, and two days later, on the night of the massacre, he was slain. Catherine seized and burned his papers, among which was—it is said—a good history of the Civil war.

Colima, the capital of a state of the same name in Mexico. The town, which is well built and paved and has regular streets, is in a fertile, well-watered plain, and has a considerable trade in cotton, linen, and woollen goods, and hardware. The port, Manzanilla, is about 60 miles west of the town, and has a good and well-sheltered anchorage, but is unhealthy, owing to the proximity of a stagnant marsh. The volcano of Colima (12,000 ft. high) is about 30 miles to the N.E., and emitted smoke and steam before the earthquake of 1868, and was in eruption in 1869. Colima was founded in 1522, and was made a city in 1824.

Colin. [VIRGINIAN QUAIL.]

Collect, a term for the short prayers which in the English Church precede the Epistle for the day, and are used also in other parts of the liturgy. They are said to have been originally prayers used in services preceding the mass—*oratio ad collectam.* The use of collects finds little or no place in the Eastern Church.

Collections, a name applied at Oxford University to examinations held in each college (usually at the end of term) for its own members, quite distinct from University examinations, and having for their ostensible object the ascertainment of a man's diligence during the term. The formidable part of collections is, or was, the appearance before the head and fellows, on which occasion a man's delinquencies and shortcomings are brought out and dwelt upon.

College (Lat.), a society. It was applied to almost any guild or association. Thus, in ancient Rome there was a College of Augurs, in modern Rome there is the College of Cardinals, Scotland has its College of Advocates, and England its College of Heralds. At the Universities the college strictly signifies the chartered corporation of head, fellows, and scholars, though its name is also used to include the general body of undergraduate members whether scholars or not. [MASTERS.]

College of Arms. [HERALDS' COLLEGE.]

Collegiate Churches are such churches as partake in some measure of the nature of a cathedral, that is, they have deans, canons, and chapters, and daily choral service, but they are not the seat of a bishopric. They are comparatively rare in England, but Westminster Abbey and Heytesbury in Wiltshire are instances.

Collembola, one of the two orders of insects known as the APTERYGOGENEÆ, on account of the complete absence of wings, not only from the living forms, but probably also from all their ancestors. They are popularly known as "Spring-tails," as they are provided with a springing apparatus situated on the under side of the body and usually tucked up under the abdomen. The typical genus is known as *Podura*, and is common among dead and damp leaves, beside pools, etc.; in this form there are no internal breathing tubes or tracheæ. [THYSANURA.]

Colley, SIR GEORGE (1835–1881), an English soldier, entered the army in 1852, when he received an ensigncy in the Queen's (2nd Foot). He was a border magistrate in Cape Colony in 1857–58, and served in China in 1860. He was next brigade-major at Plymouth, and a professor at the Staff College. He commanded the transport service in the Ashantee campaign, and in 1875 he went with General Wolseley to Natal. He then became private secretary to Lord Lytton, the Viceroy of India, and in 1880 he was made Governor and Commander-in-Chief of Natal. He was shot at the action with the Boers at Majuba Hill in February, 1881.

Collie, the northern name for the sheep-dog, now generally used to denote a special strain bred for companions to, rather than servants of, man, for both which offices they are admirably fitted by their high degree of intelligence. The collie should stand about 20 inches at the shoulder, be lithe and active, but strongly built, with shoulders well set back, deep chest, broad muscular back, strong, straight forelegs, sickle-shaped hocks, free of feather to the heel, and small, somewhat round feet. The head should be long and sharp, with small semi-erect ears. The colours are black and tan, black, white, and tan, black and white, sable, and grey. The coat is double: the under coat is short and close like sealskin, and well-fitted to resist the damp; the outer coat is harsh and coarse; in rough collies the latter is long, in smooth collies it is short. The former carry a good deal of feather on the fore legs and on the hind legs down to the hock, and the long outer coat forms a kind of ruff which is absent in the smooth collie. Wonderful stories are told, on good authority, of the intelligence of this breed when employed as sheep-dogs. Their only drawback as companions is a somewhat uncertain temper, which, however, is more apt to be manifested to strangers than to the animal's master or mistress, to whom it is ordinarily devotedly attached.

Collier, ARTHUR (1680–1732), an English metaphysician, born at Longford Magna, Wiltshire, where his father held a family living. After passing through an Oxford course, he became in his turn rector of Langford in 1704. While he was at Balliol he had turned his attention to Descartes and Malebranche, and he gave to the world his views in 1713, when he published his *Clavis Universalis*, to demonstrate the non-existence and the impossibility of an external world. His view bears a striking resemblance to that of Berkeley (q.v.). Other works of Collier's are *A Specimen of True Philosophy* and *Logology*.

Collier, SIR GEORGE, British naval commander, was born in 1738, entered the Royal Navy in 1751, and was raised to the rank of commander in 1761 and to that of captain in the following year. He had, however, no chance of gaining distinction until the outbreak of the American war. He then commanded the *Rainbow*, 44, and captured, among other vessels, the *Hancock*, 36, after a long chase. He also destroyed the stores which had been collected for an American expedition against Nova Scotia, and, before the conclusion of hostilities, became commander-in-chief (as commodore) on the North American station. As such he led a very successful expedition to the Chesapeake, and was most active in the neighbourhood of New York. His last exploit there was to destroy the whole force of the enemy in the Penobscot. Sir George, who had been knighted in 1775, took part in 1780 in Darby's relief of Gibraltar. He attained flag-rank in 1793, and died a vice-admiral in 1795.

Collier, JEREMY (1650–1726), a famous non-juring clergyman, who was born in Cambridgeshire and educated at Caius College, Cambridge. He took orders, and became rector of Ampton, near Bury St. Edmunds. He then came to London, and was lecturer at Gray's Inn in 1685. After the Revolution he could not reconcile himself to the new powers, and was twice committed to Newgate, once for writing in defence of the Stuart claim, and once for an alleged treasonable correspondence. But his great offence against Government was the giving absolution to Sir John Friend and William

Perkins, who were executed for an attempt to assassinate William III. For this he was forced to fly the country, and he remained under sentence of outlawry for the remainder of his life, though after a time he returned to London and devoted himself to literature. In 1697 he published *Essays on Several Moral Subjects*, and in 1698 his famous *Short View of the Immorality and Profanity of the Stage*, a work which brought him into collision with Congreve, Vanbrugh, and others, who turned him into ridicule. Macaulay has praised to some extent what he wrote, and it certainly had the effect of purifying the stage. He also translated into English a *Dictionnaire Historique*, and wrote an *Ecclesiastical History of Great Britain*, and in 1725 he published some *Practical Discourses*.

Collier, JOHN, commonly known as "Tim Bobbin," was the son of a curate at Stretford, near Manchester. From 1739 to 1786 he was master of a school at Milnrow, Rochdale, and used to write satirical verses which were accompanied by grotesque drawings. In 1739 he published a rhyming satire, called *The Blackbird*, and in 1775 his *View of the Lancashire Dialect*, which had a great success. Others of his works are *Truth in a Mask*, *The Fortune Teller*, and *The Human Passions*, a set of 120 engravings with explanatory verses.

Collier, JOHN PAYNE (1789–1883), a Shakspearian critic and commentator, who was the cause of much controversy upon the point whether he did or did not forge some alleged old marginal notes in a copy of the Second Folio of Shakspeare (1632) called, from the name on the cover, "the Perkins folio." He strenuously denied it, but the weight of evidence againt him seemed overwhelming. He was the son of a reporter and journalist, who was a companion of Lamb, Hazlitt, Coleridge, and Wordsworth. The boy took to writing at a very early age, and became a parliamentary reporter. In 1829 he was called to the bar. It was in 1820 that he made his first serious effort in literature by the publication of a *Poetical Decameron*. He next produced a *History* of English Dramatic Poetry to the time of Shakspeare and the annals of the Stage to the Restoration; and in consequence of this work he became librarian to the Duke of Devonshire, and so gained access to valuable MSS. and early editions. From 1835 to 1839 he brought out new facts as to the life and works of Shakspeare, and in *Shakspeare's Library* he gave the poems, tales, and novels upon which Shakspeare based his plays, and from which to some extent he drew his materials. He did much editing for the Camden Society Papers and for the Shakspeare Society. His *Notes and Emendations* contained the alleged forgeries, which involved him in a great amount of trouble and odium. The British Museum experts reported on them very unfavourably to him in 1860. In 1847 he was appointed secretary to the Royal Commission on the British Museum, and in 1850 he retired to Maidenhead. He produced many other works besides those mentioned.

Collier, ROBERT POWELL. [MONKSWELL.]

Collimation, the adjustment of the axis of a telescope so as to coincide with its optical axis. The elimination of errors of collimation are important to surveyors in theodolite work, and still more so to astronomers in the use of the transit-telescope.

Collimator, a word falsely derived, and more correctly written *collineator*. In a corrupt Latin MSS. the verb *collimare* was found in the sense of to put in line with, to aim at. Hence the word *collimator*, which is a term used in astronomy. The collimator is an auxiliary telescope, which enables the deviation between the true axis and the observer's line of sight to be ascertained, and so accuracy to be secured. In the spectroscope the collimator is a slit in the object-glass, by which the rays pass from the prism.

Collingwood, CUTHBERT, BARON, British naval officer, was born in 1750 at Newcastle-on-Tyne. He received some education at the grammar school of the town, but in 1761 was removed from it at the desire of his maternal uncle, Richard Brathwaite, who, being in that year made captain of the *Shannon*, 28, took the boy to sea with him. Collingwood served on shore at the battle of Bunker's Hill, and so much distinguished himself that on the very day of the action (June 17, 1775) he was promoted to be lieutenant. In 1776 he was appointed to the *Hornet* sloop and sent to Jamaica, where he moved into the *Lowestoft*, in which ship Nelson was also a lieutenant. Thenceforward, the two, who had previously known one another, became devoted friends. When Nelson was transferred to the *Bristol*, Collingwood succeeded him as first lieutenant of the *Lowestoft*; when Nelson was promoted to command the *Badger*, Collingwood took his place in the *Bristol*; and when Nelson, in 1779, was posted to the *Hinchinbroke*, Collingwood was made commander of the *Badger*. Finally, when Nelson left the *Hinchinbroke* for a larger ship, Collingwood was posted as his successor. In his next ship, the *Pelican*, he was in August, 1781, wrecked upon the Morant Keys. As no blame attached to him, he was soon afterwards appointed to the *Samson*, 64, in which he served until the proclamation of peace in 1783. During the early part of the peace he commanded the *Mediator* in the West Indies, where his friend Nelson commanded the *Boreas* at the same time. From 1786 to 1790 he was able to live at home in Northumberland, but in the latter year he was appointed to the *Mermaid*, 32, and again paid a visit—this time a brief one—to the West Indies. On his return he married Sarah Blackett, by whom he afterwards had two daughters. Upon the outbreak of the great war in 1793 he was appointed to the *Prince*, flagship of Rear-Admiral Bowyer, with whom he removed into the *Barfleur* and took part in the action of the Glorious First of June, 1794, when the ship lost 34 killed and wounded. Two months after the battle he removed to the *Hector*, 74, and afterwards to the *Excellent*, 74, in which he reaped much glory in the hard-fought battle of Cape St. Vincent on St. Valentine's Day, 1797. He remained with Lord St. Vincent's fleet

till 1799, when he was promoted to flag rank. Upon the renewal of the war in 1803 he was employed in the Channel until, in May, 1805, he was detached with a squadron to reinforce the blockading fleet off Ferrol and Cadiz. In September, upon Nelson resuming command, Collingwood became his second, and on October 21, 1805, with his flag in the *Royal Sovereign*, he led one column into action off Cape Trafalgar. Collingwood, who had been made a vice-admiral in 1804, was rewarded with a barony, the thanks of both Houses, and a pension of £2.000 a year, and was confirmed to the chief command in the Mediterranean. There he remained until on March 7, 1810, his worn-out frame gave way, and he expired off Port Mahon. His body was brought home, and was buried, close to that of Nelson, in St. Paul's Cathedral.

Collins, ANTHONY (1676–1729), an English philosophical and theological writer, born near Hounslow, the son of a country gentleman, was educated at Eton and King's College, Cambridge. He was an intimate friend of Locke, whose letters show that he had a high opinion of Collins. In Holland he made the acquaintance of Leclerc and other Dutch scholars. In 1715 he took up his abode in Essex, and became justice of the peace and deputy-lieutenant, passing his life without molestation, in spite of his writings, except upon one occasion when a petition was vainly presented for his removal from the commission. His first notable work was an *Essay Concerning the Use of Reason* (1707), and in 1713 appeared his most famous treatise, a *Discourse of Freethinking*, which made a great impression and called forth many answers. His *Apology for Free Debate and Liberty of Writing*, with a *Discourse upon the Grounds and Reasons of the Christian Religion*, followed in 1724. This aimed a blow at Christian revelation, and produced many answers, in rejoinder to which he published, in 1727, his *Scheme of Literal Prophecy Considered*. As a philosopher Collins was a Necessitarian, and in 1715 supported his theories in his *Inquiry Concerning Human Liberty*, and in his *Liberty and Necessity* (1729). He also, in a *Letter to Mr. Dodwell*, treated of the nature and attributes of the soul, especially as to its mortality or immortality.

Collins, MORTIMER (1827–1876), English lyrical poet, novelist, and general writer, was born at Plymouth, where his father was a solicitor. He was educated at a private school, and then became a schoolmaster, which occupation he quitted for literature in 1856. He published a volume of verse in 1855, and a second volume, *The Inn of Strange Meetings*, in 1871, and in 1872 a longer poem, *The British Birds*. His first story, *Who was the Heir?* appeared in 1855, and one of the best of his many novels, *Sweet Anne Page*, in 1868. He wrote some novels in collaboration with his wife, *Sweet and Twenty* being one. A collection of essays, *The Secret of a Long Life*, appeared in 1871, and he wrote largely for journals and magazines. His *Select Poetical Works* were published in 1886.

Collins, WILLIAM (1721–1759), a great English lyric poet, was the son of a Chichester tradesman. He was educated at Winchester and Oxford, and it was at Winchester that he wrote his *Persian Eclogues* (which were his most popular poems during his lifetime), though they were not produced in London till 1742. He sent in 1739 some verses to the *Gentleman's Magazine*, which attracted the attention of many, among others Johnson. His second work, *A Letter to Sir Thomas Hanmer*, a poem in review of poetry, was published in 1743, within a few days of his taking his degree. Shortly afterwards he came to London, but the indolence that was his great weakness prevented his settling into any steady employment, and he fell into habits of dissipation, which reduced him to great straits. It was during this period that he wrote the twelve *Odes*, which are in some respects matchless. In 1749 he developed symptoms of madness, and wrote nothing of note afterwards. The charm of his Odes has been generally admitted, and for language and form they are considered to be second to none. *The Passions*, the ode on *Popular Superstitions*, those to *Simplicity* and to *Evening* are general favourites. In 1750 he wrote an *Ode on the Music of the Grecian Theatre*, but that has not come down to us.

Collins, WILLIAM (1788–1847), an English painter, chiefly of figures and landscapes, was born in London, and was of an Irish family. He entered the Academy under Etty in 1807, and in 1809 exhibited his first pictures—*Boys at Breakfast* and *Boys with a Bird's Nest*. In 1812 his *Sale of the Pet Lamb* brought him popularity, and in 1815 he was made A.R.A. and in 1820 R.A. After a visit to Italy in 1837–38 he painted some pictures on Italian and on sacred subjects, but in 1842 he returned to his own special field of coasts and boats and fishermen and country children. His *Blackberry Gatherers*, *Happy as a King*, *The Fisherman's Departure*, and *The Birdcatchers*, are well known. He exhibited 169 works.

Collins, WILLIAM WILKIE (1824–1889), an English novelist, son of William Collins, R.A., was born in London, and educated at Highbury. He went with his father to Italy in 1837, and after his return went into business. He soon quitted this and entered Lincoln's Inn, but eventually took to literature. His first work was a *Life of William Collins, R.A.* (1848), which was followed by *Antonina* (1850). Then followed in rapid succession those books which have made him one of the most popular of modern novelists. *The Woman in White* was the first to strike the general public, and is, perhaps, the general favourite, but to some *No Name*, *The Moonstone*, and *Armadale* are no less attractive. Most people are familiar with *Count Fosco*, *Old Mazey*, *Captain Wragge*, and *Ozias Midwinter*. In a letter to Charles Dickens, Wilkie Collins gives an interesting account of how, when the book was finished, he went down to Broadstairs at a loss for a title, and how the sight of the white lighthouse, as he lay upon the cliff, suggested to him *White Woman*, then *Woman in White*.

Collinson, PETER, an enthusiastic horticulturist, was born in 1694, either in London or near Windermere, being of a Westmoreland family

belonging to the Society of Friends. He was a woollen-draper, but kept up a large garden till 1749 at Peckham, and subsequently at Mill Hill. He employed John Bartram to collect novelties for him in America, and was the friend and correspondent of Franklin, Linnæus, Sloane, Derham, and other naturalists of his time. He contributed to the *Gentleman's Magazine* from 1751 to 1766, was made F.R.S. in 1728, and F.S.A. in 1737, and died in London in 1768.

Collodion is made by dissolving gun-cotton (pyroxylin) in ether and rectified spirit. The liquid on exposure to the air rapidly loses its volatile constituents, and "sets" forming a jelly-like, tenacious, solid mass. If collodion be painted over an abraded surface, as evaporation occurs a protecting film is formed; moreover, this film tends to shrink, and so will serve to maintain the edges of a wound in apposition. From ordinary collodion is prepared *Collodium flexile* (collodion, 48; Canada balsam, 2; castor oil, 1); while *Collodium vesicans* is the name given to a solution of gun-cotton (one part) in blistering fluid (20 parts).

Colloids (Gk. *kolla*, glue), the term applied by Graham to substances which do not possess the power of passing, when in solution, through parchment or animal membrane; and gum, gelatine, glue, *e.g.* some forms of inorganic substances belong to this class. [CRYSTALLOIDS, DIALYSIS.]

Collot d'Herbois, JEAN-MARIE (1750–1796), a French republican, statesman, mountainist, member of the Convention, and member of the Committee of Public Safety. He was born of an ordinary family, and became an actor, achieving a certain amount of dramatic success. In 1792 his *Almanach du Père Gérard*, written to advance and explain revolutionary principles, brought him into notice, and he was elected deputy. He proposed the abolition of royalty, and he voted for the death of the king. In 1793 he became a member of the Committee of Public Safety. Later he was sent with Fouché to carry out the decree of the Convention with regard to Lyons, *i.e.* to destroy it and change its name. They destroyed the ramparts and forts and a few houses, and as a quick way of getting rid of those found guilty of enmity to the Republic, they shot 339 people, acquitting, however, more than 1,800 accused. An idle tale has been set about that Collot d'Herbois did this because he was hissed at Lyons as an actor. Not only is there no proof of this, but the balance of evidence shows that he had been a popular actor there. An attempt to assassinate Collot on his return increased his popularity and also the dislike of Robespierre for him. He was in Robespierre's proscription list, and took part in the movement that overthrew him. Nevertheless he was shortly afterwards denounced and banished to Cayenne, where he soon died.

Collotype, a term including a number of photographic printing processes which, though differing in details, all depend on the action of light upon a gelatine film sensitised by means of potassium bichromate. Such a film loses, in those places where the light has acted, its power of absorbing water, but is able to receive greasy matter as printer's ink. A glass plate with the sensitised gelatine film upon it is therefore prepared and exposed to light under a photographic negative, which should be a "reversed" negative. It is then washed with cold water, and used as a "block" for printing from, only those parts which had been exposed to the light receiving the ink.

Collusion (from the Latin *collusis*, from *colludo*, to play together, to unite in the same play or game for the purposes of fraud or deception) is a deceitful compact between two or more persons to do or omit some act for the purpose of prejudicing the interest of some other person or persons, or for some improper purpose. In judicial proceedings it is a secret agreement between two persons that the one shall commence an action against the other, in order to obtain the decision of a judicial tribunal for some sinister purpose, and it is of two kinds:—(1) When the facts brought forward to warrant the sentence of the Court do not exist. (2) When they exist, but have been corruptly preconcerted for the express object of obtaining the decision. In either case the judgment thereby obtained is a nullity. Collusion between the petitioner and either of the respondents in presenting or prosecuting a suit for dissolution of marriage is a bar to such suit. So in bankruptcy, dispositions of a collusive character are void as against the trustee. [MARRIAGE, BANKRUPTCY.]

Collyrium, an eye wash.

Colman, GEORGE (1733–1794), the elder, an English dramatic writer, who was born at Florence, and educated at Westminster School and Christ Church, and having entered at Lincoln's Inn was called to the bar. In 1761 he produced his piece, *Polly Honeycomb*, which was very successful. His next best piece was, perhaps, *The Clandestine Marriage*, in which Garrick collaborated. In 1767 he became manager of Covent Garden, and in 1777 manager of the Haymarket. In 1785 he was attacked by paralysis, which affected his mental powers, and his public life was ended. Besides writing many plays, he made translations of Terence, Plautus, and Horace, and published both prose and verse.

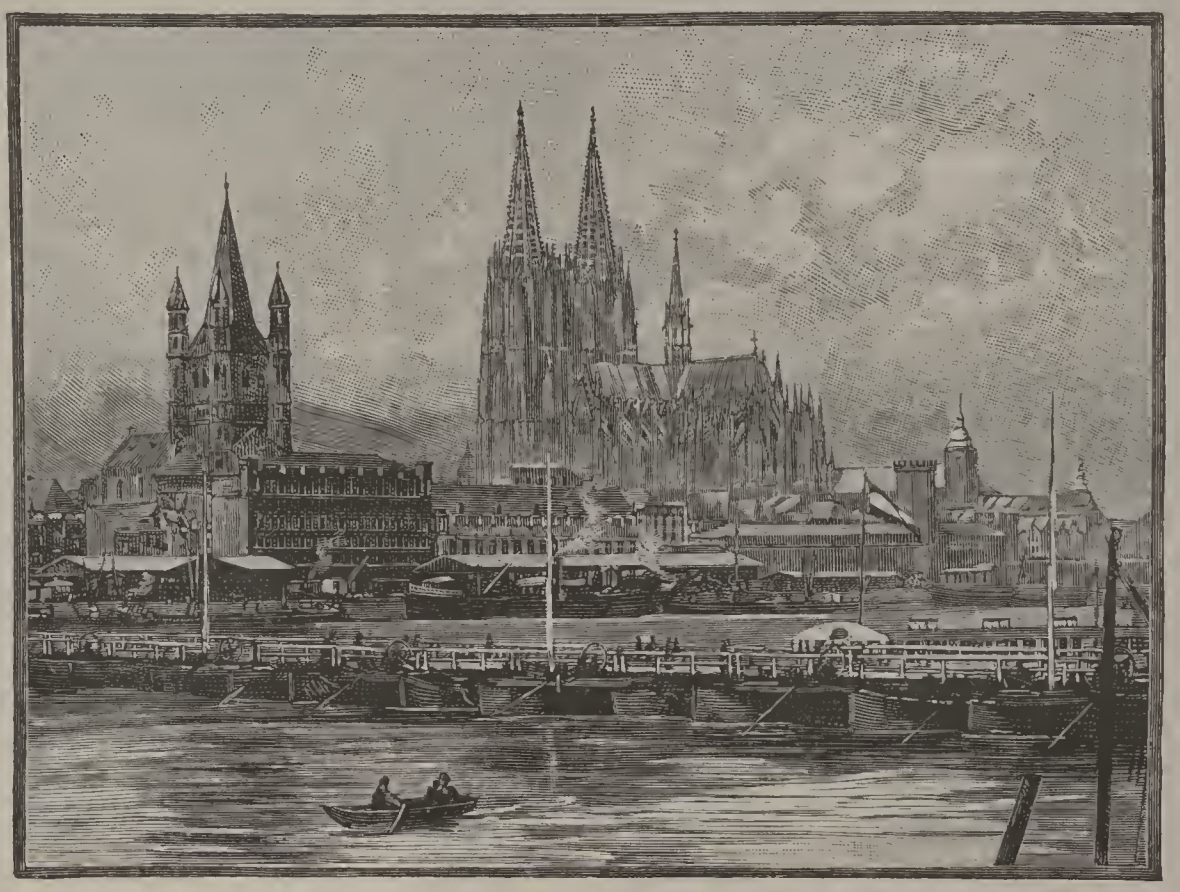
Colman, GEORGE (1762–1836), the younger, dramatist, was educated at Westminster School and at Christ Church, and entered at the Temple. His first play—produced in 1782 at the Haymarket, then under his father's management—was the *Female Dramatists*, founded on *Roderick Random*. He succeeded his father in the management of the Haymarket, but difficulties beset him for some years. He was afterwards appointed Examiner of Plays, a post which he held till his death, and in which he managed to give great offence to his brother dramatists. Of his plays the best are, perhaps, *John Bull*, and the *Heir-at-Law*. He also published some grotesque verse, among it being *Broad Grins* (1802).

Colmar, the chief town of the German province of Upper Alsace, on the Lauch. A canal connects it with the Rhine, and it is on the railway

to Strasburg, from which city it is distant 40 miles. The cathedral is a historical monument of fourteenth-century architecture, and the tower commands a fine view of the Vosges. The thirteenth-century convent of St. Benedict Unter Linden has a perfect specimen of cloisters. The town possesses a good museum of paintings and works of art, and a library. There are manufactures of cotton, paper, leather wadding, and animal black, as well as breweries, distilleries, foundries, and tanneries. The Romans had a fortress here, called Columbaria. In 1697 Colmar became French under the Treaty of Ryswick, and in 1871 it again became German.

Colne, a market town of E. Lancashire, on a feeder of the Calder, and about 26 miles N. of Manchester. In the fourteenth century it was noted for its woollen manufactures; now its chief productions are calicoes and mousselines-de-laine; Archbishop Tillotson was educated here. Limestone and slate are worked in the neighbourhood.

Colney Hatch, chiefly noted for its great lunatic asylum, is in Middlesex, about six miles N. of London.



COLOGNE CATHEDRAL AND THE CHURCH OF THE APOSTLES.

Colocynth, *Citrullus Colocynthis*, the bitter cucumber, is a member of the order *Cucurbitaceæ*, native to Asia, but now widely diffused. There are three preparations of this drug in the British Pharmacopœia—extractum colocynthidis compositum, dose 2 to 5 gr.; pilula colocynthidis composita, dose 5 to 10 gr.; and pilula colocynthidis et hyoscyami, dose 5 to 10 gr. Colocynth is a useful purgative for occasional use; it is not adapted for those who suffer from habitual constipation. The combination of colocynth and hyoscyamus is particularly valuable, and this pill is perhaps more often prescribed than any other purgative pill in the pharmacopœia.

Cologne, in German KÖLN, the *Colonia Agrippina* of the Romans, capital of Rhenish Prussia, is on the left bank of the Rhine, 45 miles N. of Coblenz. The town forms an arc, of which the river is the chord, and a bridge of boats and an iron bridge connect it with the suburb of Deutz on the opposite bank. The town, with its cathedral and many churches, presents a very picturesque aspect from a distance, and the Rhine, with its boats and isle and opposite suburb, is interesting, but the city is dirty and irregularly built, and Coleridge's description of it still holds good in the main. The cathedral, now finished, though tradition represented its completion as impossible, occupies a site said to have been covered by a church almost from the beginning of European Christianity. Part of the present building dates back to 1248. The spires were finished in 1880. It is in the form of the Latin cross, 480 ft. long, 282 ft. broad, and 154 ft. high, the towers and spires being over 500 feet. Cologne is noted for its relics. The shrine of the Three Kings is in the cathedral, the bones of St. Gereon and the 308 martyrs of the Theban Legion are in the church of St. Gereon, while the church of St. Ursula contains the bones of the 11,000 virgins. There are other public buildings of much interest, especially the thirteenth-century Rathhaus, of many architectural styles, and the twelfth-century Tempelhaus. Cologne is well situated for commerce, being in the centre of the Rhine trade, and communicating directly with Antwerp and the Low Countries, Germany, and Switzerland. Beside the trade in wine and corn, there are manufactures of cotton and woollen goods, silks, carpets, porcelain, soap, sugar, tobacco, and the noted eau-de-Cologne. In 1212 Cologne was an imperial city, a member of the Hanseatic league, rich, populous, and sometimes called the "Rome of the North." Petrarch admired it greatly. The discovery of America much injured its trade, the expulsion of the Jews in 1425 did it damage, and the persecution of the Protestants in 1618 harmed it still more. But the final blow to its prosperity was the closing of the Rhine by the Dutch in the eighteenth century. The river was closed till 1837, since which time Cologne has been steadily rising in prosperity. In 1794 it became French, but was restored to Germany in 1814.

Colombia, UNITED STATES OF, a South American Republic (formerly Federal, but centralised since 1886) in the N.W., and including the Isthmus of Panama, between lat. 12° 25′ N. and 5° 8′ S. and long. 70° 40′ and 82° 40′ W., with an area of over half a million square miles.

The Atlantic coast-line is over 1,000 miles, well provided with bays and natural harbours, the chief of which are the mouth of the Magdalena, with its port Barranquilla, the bay of Carthagena, the bay of Portobello, the port of Colon or Aspinwall, and the harbour of Trinidad upon the island of Gorgona. In the west, Colombia is very mountainous, forming part of the Andes system. In the south is an extensive plateau, averaging from 10,000 to 11,000 ft. in height, and from this three ranges, almost parallel, branch off northwards. The Central Cordillera has the lofty snow-peak of Tolima, the Eastern is said to reach a height of 23,000 ft., and the Western, which extends most to the north, is in some parts little more than a series of rounded hills. The eastern part of the country makes part of the Amazon and Orinoco plains. These llanos extend from the slopes of the Cordilleras, and being almost treeless afford good pasturage. Farther south they have a more broken surface, and are covered with forests. The formations of Colombia are igneous and metamorphic, and the volcanic agency is still active. There are glaciers in the Cordilleras, and the slopes are often covered with gravel, and the valleys with alluvial deposits.

Most of the Colombian rivers belong to the Atlantic basin, the two most important being the Magdalena between the E. and Central Cordilleras, and the Cauca between the Central and W. Cordilleras, both flowing N. They unite before reaching the sea. The most important of the Orinoco rivers are the Guaviare, the Meta, and the Vichada. Among the less important rivers may be mentioned the Atrato, which flows into the Gulf of Darien, and has been thought to present a possible solution of the question of an inter-oceanic canal, and the river Iça, a tributary of the Amazon, which possesses many navigable branches and passes through a region rich in natural resources not yet developed.

Colombia is extremely rich in minerals, which have not yet been greatly worked, owing to defective communication. Alum, antimony, asphalte, coal, copper, gold, iron, lead, limestone, magnesia, mercury, platinum, potash, silver, and soda all abound, and amethysts and amber are found, while the emeralds have a world-wide reputation.

The climate of Colombia has great variations, owing to the irregularity of surface, and the fauna and flora are equally various. Agriculture and cattle-rearing are the chief industries, the latter especially in the Orinoco plains and the Savannahs of Panama. On the higher parts of the plains maize and wheat are grown, and lower come cocoa, coffee, cotton, rice, sugar, and tobacco. Almost the only manufactured articles exported are the Panama straw-hats, but there is a considerable export of raw produce.

The population consists of Indians and cross-breeds, Spanish creoles, and negroes. There are still a few wandering bands that represent the Chibchas, the most important of the tribes at the time of the Spanish conquest, and other savage tribes still exist to the number, it has been calculated, of about 120,000.

From the middle of the sixteenth century Colombia was a vice-royalty or presidency till, in 1819, Bolivar united it with Venezuela and Ecuador into the Republic of Colombia. These two states afterwards withdrew. Since then Colombia has been the scene of almost continual struggles and changes, though it appears now to have entered upon a period of stability.

Colombo, a seaport town and capital of Ceylon, on the W. coast, in lat. 6° 55′ N., and long. 77° 45′ E. Part of the town is fortified and is on a rocky promontory surrounded by the sea on three sides, and protected on the fourth by a lake and moat. The town has many fine buildings and is supplied with water and gas. Among other marks of the Dutch occupation are the trees which shade most of the streets, and the cinnamon gardens. One part of the town—Pettah—is occupied chiefly by natives and half-castes; another, Colpetty, is a pleasant suburb. The harbour has been much improved of late by the construction of a breakwater, and has taken the place of Galle as a coasting station. The population of Colombo presents great variety, including Singhalese, Parsees, Chinese, Afghans, Arabs, Malabars, Persians, Kaffirs, descendants of Portuguese and Dutch, and all kinds of half-castes. The Arabs discarded the ancient name of the town and called it Kalambu, which the Portuguese changed to Colombo. The Dutch captured it in 1656, and surrendered it to the British in 1796.

Colon, the name given to a part of the large intestine. The colon is divided into three portions—the ascending, transverse, and descending, as they are termed. The ascending colon runs upwards from the cæcum towards the under surface of the right lobe of the liver; then it bends almost at right angles, and is continued transversely across the abdomen as the transverse colon; in the neighbourhood of the spleen, a second bend at a right angle carries the transverse into the descending colon, which runs downwards towards the left iliac fossa, and terminates in that portion of large intestine which is known as the sigmoid flexure. The junction of the ascending and transverse colon is termed the hepatic flexure, and the junction of the transverse with the descending colon is known as the splenic flexure of the colon. [Intestines.] In certain cases of intestinal obstruction it is necessary to open the colon by surgical operation; to such a procedure the term colotomy is applied.

Colonel (Lat. *columna*, a column, or, according to some, *corona*, a crown), a word used in the English army to denote the commander of a regiment. The post is becoming obsolete, and is only used to reward the services of a superior officer by giving him the pay attaching to it. Each battalion of a regiment is really administered by its own lieutenant-colonel. The colonelcy of a regiment is often bestowed as a compliment upon princes, even foreign ones, and upon crowned heads, and in some countries upon women.

Colonia, a province in Uruguay on the Plata, having an area of 2,185 sq. miles, and consisting of

fertile valleys and plains, where European colonists rear cattle and practise agriculture. The capital—same name—has a good harbour and dock.

Colonial Corps of the British army were regiments stationed in a colony for its defence exclusively, but paid for out of the Army Estimates. Such were the Cape Mounted Rifles, the Malta Fencibles, and other corps. They have gradually been disbanded, local militia being substituted. There are still, however, West India regiments the rank and file of which are negroes, and which are partly stationed in West Africa, and native troops at Ceylon and Hong Kong.

Colonial Office. English Colonies were originally under "The Board of Trade and Plantations," but in 1774 an Act was passed making Canada one royal government under the name of Quebec, and placing it under a Secretary of State for the Colonies, who is now always a member of the Cabinet. This office was for a time (1801–1854) united with that of the Secretary for War. The Crown Colonies are governed through the Colonial Office, and it is the channel of communication with the rest. The staff now includes a parliamentary and a permanent under-secretary, three assistant under-secretaries, and some twenty-five clerks, with other officials, copyists, etc.

Colonies, in palæontology, consist, according to M. Barrande, who introduced the term in 1852 in his "Silurian System of Central Bohemia," of faunas, or assemblages of fossils which, though characteristic of some later period, occur intermingled with an earlier fauna. This he explained as due to migration under changing conditions; but, though there is undoubtedly much that is true in the general "doctrine of colonies," it has been shown that M. Barrande's instances are fallacious, being in fact owing to great inversions of strata in the Silurian rocks of Bohemia.

Colonna, VITTORIA (1490–1547), an Italian poetess, a member of the powerful Roman family Colonna, and daughter of Fabrizio Colonna, grand constable of Naples. She was betrothed when quite young to Francesco d'Avalos, son of the Marquis of Pescara, and married him when she was seventeen. In 1511 the husband fought in the Holy League, and was taken at Ravenna, and imprisoned in France. For some years the fortunes of war kept them apart, and they corresponded with each other in prose and verse. In 1525 Francesco died of his wounds at Milan, while his wife was on the road to meet him. She then gave herself to poetry, and wrote her *Rime Spirituali*. In 1538 she came to take up her abode in Rome, and there made several friendships, one friend being Reginald Pole, and another and most devoted friend being Michael Angelo. Owing to her brother's revolt against the Pope she had to leave Rome, and from 1541 to 1545 she lived at Viterbo, then governed by Reginald Pole. She returned to Rome the year before her death.

Colonsay, an island of the Hebrides, in the county of Argyllshire, lying a few miles W. of Jura, having an area of 16 sq. miles, and rising at Cairn Nan Eim to a height of 493 feet. There are bone caves on the island, and some standing stones, and also an obelisk to the memory of Lord Colonsay. A little to the south, and separated by a passage which is dry at low water, is the small island of Oronsay, which has an Augustinian priory of the 14th century containing some effigies, and there is also a sculptured cross.

Colony, in the widest sense, is a settlement in some foreign and uncivilised country. Modern usage applies the term only so long as the settlement remains a dependency of the mother country. But the Greek colonies almost always, and the Phœnician frequently, were independent from the first. The latter were originally "factories" or trading ports. Some of them, however, grew into independent cities (Carthage for instance). Later the pressure of population in Greece caused numerous colonies to be founded on the Euxine, in Sicily and South Italy, and North Africa, between 730 and 500 A.D., almost always under the direction of the Delphic or some other oracle. These colonies (*apoikiai*) are to be distinguished from the mere trading posts, of which Miletus (for instance) had many on the Euxine. The first band of settlers was led by a founder, who gave the new city its laws and was worshipped after his death as a kind of patron saint. The *apoikia* was a city community politically independent (with one or two doubtful exceptions) of its mother city or "metropolis," and connected with it only by the tie of religious sentiment. The same relation is said to exist between certain pairs of villages in Russia, one of which traces its origin from the other. "Mother" and "daughter" villages were also recognised in early Germany. By about 470 B.C. hardly any more sites were available, and the pressure of population in Athens, and to some extent in Corinth, was then relieved by founding "kleruchies" (lit. allotments) on part of the territory of subject states. These settlements, which historians do not usually call colonies, as they had little (if any) separate political organisation, were really garrisons primarily, and secondarily relieved the pressure of population at home. Roman colonies had the same objects as these "kleruchies," but had a distinct municipal organisation. The two objects varied in relative importance at different periods. During the last century of the Roman Republic the object was mainly to provide subsistence for poor citizens. Under the Empire the colonies were always settlements of discharged soldiers, and were thus both a substitute for pensions and a means of securing the provinces. Cologne and Lincoln preserve the Roman name Colonia.

A few modern colonies have been convict settlements, or founded primarily as an outlet for population; but most have been founded originally with a view to trade. Venice in the Middle Ages had a number of dependencies in Albania, Greece, and elsewhere, held and governed solely in the interests of her trade. During the 15th century the Portuguese pushed their way along the West African coast, occupied Madeira, the Azores, and

points on the mainland, and were followed by the Spanish. In 1492 Columbus found his way to the West Indies; in 1497 the Portuguese doubled the Cape of Good Hope, and founded several trading ports (on the Venetian plan) in India. One or other of these nations speedily conquered various parts of South and Central America, solely, it would seem, with a view to the stores of gold and silver that existed there. [MERCANTILE SYSTEM.] Grants of land were, however, made to Spanish and Portuguese subjects, who settled and worked their estates much as they would have done at home. The English colonies were founded partly also with a view to obtain gold and silver, but were usually managed by commercial companies; Newfoundland was founded in 1607, Virginia in the same year. But the decay of the old land system in England and the religious difficulties stimulated emigration, as in the case of the Pilgrim Fathers [MASSACHUSETTS], and many of Cromwell's Irish and Scottish prisoners were sent by him to the West Indies and the Carolinas. So also after Monmouth's rebellion; and convicts were long sent to Virginia. The French colony in Canada was founded in 1603. [CANADA.] The Dutch gradually supplanted Portugal in the East 1602–1609, and founded Batavia (q.v.) in 1618. All European natives regarded their colonies at first as sources of a supply of gold and silver; when it was found that many of them did not contain it, their trade was put under oppressive restrictions to give the mother country the monopoly of their commerce. They were regarded as providing markets for its manufactures, and as furnishing it with valuable products which it could sell for specie. This "colonial system" was most thoroughly applied by Spain and Portugal, with the effect of checking their own development, by withdrawing their capital, as well as hampering the progress of their colonies. In England it originated under Cromwell, but was far less thoroughly applied than abroad. Still, the usual relation of official England to the colonies in the last century may be illustrated by the story of the English statesman who, being asked to appoint chaplains for the good of the souls of the colonists, cursed their souls and bid them grow tobacco.

The rising in Canada (q.v.) in 1837 made it necessary to concede responsible government to it. Victoria was the first Australian colony to receive a like privilege (in 1857). At present there are three classes of English colony:—Crown colonies, which are governed from the Colonial Office, colonies with representative institutions but not responsible government, in which the Home Government has a veto on legislation, and colonies with responsible government, like Canada and New South Wales, between which and the mother country the Governor-General is practically the only political link. (For the various English colonies *see* separate headings.)

Of foreign nations, only France, Spain, Portugal, and Holland now possess important colonies. Denmark has Iceland, a few settlements in Greenland, and some small West Indian islands; Spain has Cuba, Porto Rico, the Philippine, Caroline, and other islands; Portugal holds Goa, Macao, the Cape Verde Islands, and settlements on the coast of E. and W. Africa; Holland has Java, Sumatra, and other East Indian islands, Surinam, and some islands off the coast of Venezuela; France has part of Guiana, and also possessions in India, Cochin China, W. Africa, and Oceania, besides protectorates in Madagascar, Tunis, Annam, etc. (Algeria does not rank as a colony). Italy possesses one small and useless colony in Abyssinia. The area and population of these colonies is approximately as under (excluding protectorates and spheres of influence):—

	Area—sq. miles.	Population.
Colonies of France ...	835,000 ...	20,000,000
,, Holland ...	766,000 ...	30,000,000
,, Spain ...	407,000 ...	12,000,000
,, Portugal ...	600,000 ...	4,000,000
,, Denmark ...	87,000 ...	116,000
British Colonies (excluding India) ...	7,200,000 ...	20,000,000

British India, with its 210 millions of population and more than a million square miles of area, has more right to be considered a colony than most foreign colonies so-called.

The French colonies are represented in the legislature; the colonies of other countries are governed much like the British Crown colonies.

The doctrine of the last century, that colonies should serve as markets for home produce, still governs the colonial policy of most foreign countries, owing to the prevalence of Protectionism.

Colonisation on a great scale has seldom been carried out on any scientific system. Prof. Seeley has remarked that the English people seem almost to have picked up their colonial empire in a fit of absence of mind. Mr. E. G. Wakefield some sixty years ago suggested that care should be taken to send out artisans as well as agriculturists to Australia, that the various classes of producers might exchange their wares and so stimulate production. His advice was followed in "assisted emigration," which has, however, now been generally discontinued.

Colophon, a city of Asia Minor founded by the Ionians, a few miles N. of Ephesus. Hardly any traces of it are left, but its name has become proverbial, and is used in bibliography to denote the finishing touch of, or final ornament to, a work. It is doubtful whether the proverb, and so the bibliographical use of the word, arose from the fact of the Colophonian cavalry having put an end to a battle by a decisive charge, or from the fact of their having the casting vote in the Ionian assembly. The French word *colophane* for *resin* is derived from the town, as the pines of the neighbourhood were renowned for their resin.

Colorado, one of the United States of America, lying between lat. 37° and 41° N., and long. 102° and 109° W., 380 miles long by 280 miles broad, with an area of about 106,500 sq. miles, having Wyoming and Nebraska on the N., New Mexico on the S., Kansas on the E., and Utah on the W. It takes its name from the Colorado, which drains the western part, while the eastern part is drained by the Arkansas, and the southern by the Rio Grande del Norte. The Rocky Mountains pass through the State from N. to S., the principal range being the

Salwatch Range, which rises in Mount Harvard to 14,400 feet, and has an average height of over 13,000 feet. The Elk mountains diverge from this range about 30 miles in a S.W. direction. The displacement of strata makes the whole region one of much geological interest. There are immense fertile valleys interspersed among the heights, the largest of the four principal ones being San Luis Park, with an area of 9,400 sq. miles. These "parks" appear to have been lakes or inland seas. There are several lofty passes through the range, and railways are carried through some of them and give plenty of scope for engineering ability. The hot springs and dry air of Colorado make it a famous health resort. The mountains were formerly well-covered with forest, but reckless waste has now well-nigh denuded them. The lower lands are eminently fitted for agriculture wherever water is plentiful, and the flour of Colorado enjoys a great reputation, while the upland grasses produce an excellent fodder. The state is also noted for its abundance of flowers. The crops suffer from the attacks of the locust, and the potato from the attacks of the Colorado beetle. The Indian tribes had this district almost to themselves till the discovery of gold in 1858, when emigration set in, and in 1861 Colorado was organised as a territory, and it became a state in 1877. Emigration received a check during the Civil war, as well from that cause as from an Indian rising, but since then it has flowed on without intermission. Much gold is produced and more silver, and since the discovery of fairly good coal in the state smelting and steel founding have made great progress. There are petroleum wells in the state. The principal towns are Denver, Leadville, and Pueblo, the first of which is the capital.

Colorado River (1) rises in the Rocky Mountains, and after a course of about 2,000 miles falls into the Gulf of California. The main stream—the Green river—rises in Wyoming, and after receiving the Bear and White rivers is joined about 150 miles from its source by the Grand river. The next important tributary is the Little Colorado from New Mexico, after receiving which the river turns west through the Colorado plateau. It then turns south and receives the Gila, Arizona city being situate at the junction. A few miles below this it reaches the sea. The Colorado is remarkable for its cañons, one—the Grand Cañon—having a length of 200 miles, with cliffs varying from 4,000 to 7,000 feet in height, and the Black Cañon, farther down, having a length of 25 miles, with an average height of 12,000 feet. The river was discovered by Fernando Alascon in 1540, but has only lately been fully explored. It is navigable for steamers to 600 miles above the mouth. (2) One of the largest rivers of Texas, with a course of 900 miles and having the capital, Austin, on its left bank. Owing to sand-bars at the mouth of the river there is very little navigation.

Colossæ, an ancient city of Asia Minor, described as a great and prosperous city by Xenophon, in the *Anabasis*. It was on the Lycus, a branch of the Mæander, and had in ancient times an extensive dyeing and woollen trade. It appears to have decayed, and to have completely disappeared during the Dark Ages, but excavations have brought to light the former city.

Colossians, The Epistle to the, is an Epistle written by St. Paul to the church at Colossæ in Phrygia, probably towards the end of the apostle's first imprisonment at Rome, along with the Epistles to the Ephesians and Philippians. Its object was to caution the recipients against false teachers, whose ritual observances were akin to those of the Essenes (q.v.), and who held a doctrine of angel-worship like that afterwards developed by the early Gnostics. The rest of the Epistle resembles that to the Ephesians. The Epistle is referred to by Justin Martyr, and quoted by Irenæus. Clement of Alexandria, and Tertullian. Some German critics like Baur and Pfleiderer, the latter of whom regards most of the Pauline epistles as post-Pauline pamphlets in that controversy between the supporters of Jewish ritual and those of spiritual Christian worship, the opening of which is referred to in Acts xv. and Galatians ii., regard it as a forgery, belonging to the end of the first or beginning of the second century.

Colossus (Gk. *a statue*), often applied in Greek to gigantic statues like those in Egypt. In the Macedonian period especially, colossal statues were erected in various parts of Greece. The best known was the Colossus of Rhodes, a bronze statue of Apollo by Chares of Lindos, 70 cubits or about 107 feet high. There is no foundation for the view that it was placed astride of the entrance to the harbour. A winding staircase led to the top. It took twelve years to set up, was hollow, and steadied with pillars of stone. Erected about 280 B.C., it was upset by an earthquake thirty-five years later, and lay on the ground till the middle of the 7th century A.D., when it was sold by a Mohammedan general to a Jew as old metal. The statues of Athene on the Acropolis at Athens and of Zeus Olympius, some 40 feet high, were hardly of colossal dimensions. In modern times the great statue of Hercules at Cassel, the statue of Arminius at Detmold, that of St. Carlo Borromeo (1697) at Arona on the Lago Maggiore (70 feet high on a 42-feet pedestal), and that of Liberty by Bartholdi on an island in New York Bay, are the most important colossal statues.

Colour is a special property possessed by ether-waves, whose wave-lengths and vibration-frequencies lie between certain approximately fixed limits. We are able to recognise in various ways and by other senses than that of sight ether-waves of widely different wave-lengths, but those with the property of colour, which can be readily recognised by this special sense of vision, have wave-lengths between $\frac{1}{13000}$ and $\frac{1}{25000}$ of a centimetre. It must not be supposed that such waves possess no other properties recognisable by our senses; they may exhibit in different degrees heating, chemical, and, perhaps, other effects. But we find that those waves with greatest intensity of colour are distinct from those with greatest intensity of heat or of chemical effect.

A *pure* colour, giving monochromatic light, is that produced by vibrations of one definite frequency or wave-length ; combinations of such waves will give us any other colours. The following table gives the more conspicuous pure colours, with their frequencies or number of vibrations per second :—

Red	4024	billions per second.
Orange-red	4841	
Orange	5033	
Orange-yellow	5112	
Yellow	5175	
Green	5700	
Blue-green	5914	
Cyan-blue	6060	
Blue	6352	
Violet-blue	6858	
Puce-violet	7405	

Black is the absence of colour ; white is a mixture of colours of all wave-lengths from the red to the ultra-violet. By prism or otherwise such white light may be resolved into its constituents, the properties of each of which may be investigated separately. [Spectrum Analysis.] White-heat means that a body has been raised to such a temperature that its particles are vibrating with all the varying frequencies capable of combining to form white light ; the red-heat stage occurs long before, corresponding to a lower temperature and lower frequencies.

White may also be produced by mixture of two colours, such as yellow and ultramarine ; such pairs of colours which combine to give white light are called *complementary*. The term *supplementary* has recently been given to colours which combine to give any definite colour. The effect of combining pigments generally depends on some common constituent that they may both possess. Thus pure ultramarine and yellow give white light, but the ordinary ultramarine and yellow pigments combine to give green. For both the pigments are impure and possess green, their combination thus giving a mixture of white and green.

Opaque substances may not reflect all the colours that fall on them, absorbing some and reflecting others. Thus, the colour of gold is due to the fact that it reflects back only the yellow. If no yellow existed in the light by which it is viewed, the gold would appear black. If we look through a transparent substance, its colour will be that which has passed through without being absorbed. If it contain foreign particles, just as the air contains dust, etc., we may see that colour which is reflected from these particles without subsequent absorption.

The structure of the organs of vision need not here be described, but in regard to the distinction of colour by the normal human eye, it is generally understood that the *retina*, upon which the light falls and over which is spread the nervous matter connected with the optic nerve, possesses three distinct kinds of nerve-elements. Each of these will respond most readily to colour-waves of one definite wave-length, that is to say, there are three physiologically primary colours that are most readily distinguished by the normal eye. Physicists differ as to what these colours are, but, roughly speaking, they are the red, green, and blue. Each of these taxes only one type of nerve-ending ; combinations of them will affect more than one type. It is probable that, just as a tuning-fork will resound to notes not quite of the same pitch as it itself gives, so will the nerve-ends respond to some extent to colours not exactly of the frequency they most readily take up. And further, just as a tuning-fork persists in vibrating after the note has died away that induced it to vibrate, so the sensation of light lasts for a short space of time after the cause is removed. This is the phenomenon of *persistence of vision.*

Imperfection in the response of one type of nerve-element has the effect of rendering that colour partially or wholly invisible to the eye ; if it existed alone, the eye would not be aware of any colour ; if in combination, the eye could only respond to the other constituents of the compound colour. Such a defect is termed *colour blindness*, dichroic if one primary colour cannot be distinguished, monochroic if two cannot be. This defect obviously involves the inability to distinguish between colours that differ only in possessing in different quantity the unrecognisable primary as a constituent.

Colour Blindness, an inability to distinguish between certain colours exists in some persons. John Dalton, the distinguished chemist, was afflicted in this way, and he, by a description of the differences which he found to exist between his colour judgments and those of ordinary persons, first directed the attention of scientific men to the subject. For this reason colour blindness is sometimes termed Daltonism. The examination of a large number of individuals has shown that some form of colour blindness is present in about 4 per cent. of the male population of civilised countries. Curiously enough, such a defect is very much more rarely met with in women. Attempts have been made to reconcile the phenomena of colour blindness with one or other of the theories of colour vision. [Colour.] There are alike difficulties, however, in applying either the Young-Helmholtz hypothesis or the theory of Hering to the actual mistakes observable in colour-blind persons, and the question must be regarded as still *sub judice.* The most commonly noticeable defect in the subjects of colour blindness is an inability to distinguish between red and green, and as these are the two colours most employed for signalling purposes, the practical importance of instituting some adequate test of normal colour vision is very great. The matter is by no means so simple as would at first sight appear. A colour-blind person will often succeed in correctly naming a series of colours, and in many instances he may be quite unaware that his colour perceptions differ in any way from those of the majority of mankind ; indeed, in some of the more slightly marked cases of colour blindness it is only by a most carefully conducted examination that the abnormality can be demonstrated. On the other hand, it is a familiar occurrence for an uneducated person to be hopelessly at fault in naming colours, quite apart from any actual defect of the nature of colour blindness. A very useful

test was devised by Holmgren, and the sets of coloured skeins of wool introduced by him are largely employed by ophthalmic surgeons in this country. Briefly, the examination is conducted as follows: A test skein is handed to the patient, and he is requested to match it from a number of other skeins. A normal eye has no difficulty in separating the wools of the same colour as the test skein from the rest, which are known as the "confusion colours." A colour-blind person, on the other hand, matches one or more of the confusion skeins with the test skein. Unfortunately, the methods adopted for the exclusion of colour-blind employés by railway companies and ship-owners are very rough and ready; it is only within very recent times, however, that the desirability of conducting any examination at all has been recognised, and doubtless more and more attention will be devoted to the matter now that its importance is so well established.

Colour Sergeant, in the British army, a rank created in 1813 as an acknowledgment of the services of non-commissioned officers in the Peninsular war. One sergeant in each company is a colour-sergeant; their duty is to guard the colours and the officers who carry them.

Colours have, with few exceptions, always been carried to designate separate regiments or corps. The exceptions are the Artillery, the Engineers, the Militia and Volunteer Engineers, the Royal Marine Artillery, the Militia Artillery, and Volunteers, and the Rifle Regiments, Hussars, Lancers, and Yeomanry. Formerly every company or squadron had a colour, and this was afterwards reduced to two, one of which was square, the other swallow-tailed. These are now reduced to one in the cavalry and two in the infantry. In the cavalry the "standard" of Dragoon Guards is of crimson silk and square, and bears the Royal title, the number, and other details; the "guidon" of Dragoons is of crimson silk, but is swallow-tailed in form. The colours of infantry are of silk. The "Royal" or first colour is the "Great Union," or Jack with the crosses of St. George, St. Andrew, and St. Patrick conjoined, and bears in the centre the territorial name of the regiment, crowned. The "Regimental" or second colour is of the same colour as the facings except when the latter are of white, in which case the colour is to be the cross of St. George on a white field, and bears the ancient badges, distinctions, and mottoes which have been conferred by royal authority. They are carried by the two senior lieutenants, while cavalry standards and guidons are carried by troop-sergeants-major. Colours are too conspicuous a mark for long-range rifles to be taken into battle in future wars. The "presentation of new colours" to a regiment, conducted with a short religious service, is a familiar ceremony. Old regimental colours are usually deposited in a church.

Colours, Ecclesiastical, were used in the Christian Church from early times to mark the seasons of the ecclesiastical year. Different sets of colours, however, were used in different dioceses. The Roman sequence is—White, on the chief festivals and from Easter to Whitsuntide; red, in Whitsun week and on days of martyrs; violet, in Lent and Advent and on vigils and rogation days; and green on all other Sundays and weekdays. The Sarum use is—White, on certain principal festivals; red, on other Sundays and saints' days; yellow, on feasts of confessors; black, on All Souls' Day and at funerals. Green and blue were sometimes used for festivals, and ash colour for Advent and Lent. The Gallican use resembled that of Sarum.

Colours, Heraldic. In heraldic art the colours are divided into three classes, *metals*, *tinctures*, and *furs*. There are two metals, silver and gold, known respectively as "argent" and "or." The latter is occasionally represented by yellow, the former nearly always by an untouched surface or by white. When represented in line-engraving argent is left plain, but the surface is covered with small dots placed at regular intervals to denote "or." Heraldry knows no other metals. The tinctures in regular use are "gules" or red, "azure" or blue, "sable" or black, "vert" or green, and "purpure" or purple. The first is represented by perpendicular lines set evenly and closely together, the second similarly by horizontal lines, and the third by perpendicular and horizontal lines crossing each other at right angles. Vert lines run downwards from left to right (which, it must be remembered, are the exact opposite of the dexter and sinister of armoury), at an angle of about 45 degrees, and to denote purpure these lines are drawn from right to left. Two other colours, tenné (orange) and murray (a dark red), are mentioned by some writers. They are very seldom met with, and are not usually considered as tinctures. There are ten sorts of fur, but of these some are never now used, except in remote instances. The most common, of course, is "ermine," which is a white ground with black ermine spots. "Erminois" only differs in having a gold ground. "Ermines" has a black ground with white spots, and "pean" is the same but with gold spots. "Erminites" is similar to ermine, but having a red hair on each side of the black spots. "Vair" is depicted as composed of small shield-shaped pieces fitted into each other, alternately blue and white placed top to top and point to point. If the colours are not argent and or, the field is said to be "vairé" of whatever tinctures it may happen to be; "counter-vair," and "vair-en-point," which are very seldom met with, are varieties of vair, the small pieces in these being arranged somewhat differently. Potent and "potent counter-potent" are furs very similar to vair and vair-en-point, but having the small pieces of which it is composed each shaped as a T. When any charge is painted in its natural colours it is termed "proper."

Colours, Vegetable, fall into four classes—(i) those in the cell-walls of bark; (ii) those in woods, as in logwood; (iii) those dissolved in cell-sap, as in the blues, violets, and some reds in flowers; and (iv) those connected with protoplasmic granules, such as chlorophyll (q.v.), etiolin, xanthophyll, anthoxanthin, phycoxanthin, and

phycoerythrin. Those of the three first-named classes are probably derivatives of tannin (q.v.). *Etiolin*, a pale yellow, seems to be an antecedent or constituent of chlorophyll. *Xanthophyll* in fading leaves, and *anthoxanthin* in yellow flowers, seem to be derivatives of chlorophyll, probably degradation-products. *Phycoxanthin* and *phycoerythrin*, characteristic of the olive and of the red sea-weeds respectively, are more soluble substances. The chemistry of these substances is almost unknown, nor is there any evidence of their having in many cases acquired a physiological importance beyond that of mere excreta. It is otherwise with colours in the floral region. Colours occurring here fall into two series: the *cyanic*, blue, violet, and red in solution, and the *xanthic*, yellow, orange, and red in chromoplastids. The two series seldom co-exist in one flower. Many large groups of plants have a limited colour-range, *e.g.* the *Umbelliferæ*, nearly all white- or yellow-flowered; the *Crueiferæ*, the same, with a few reds; the *Caryophyllaceæ*, mostly red and white. Colour and perfume are frequently correlated, many white flowers being sweet-scented, especially in the evening; whilst many brownish flowers have a scent of carrion. This seems to be a close adaptation to cross-pollination by dusk-flying moths in the one case, and by carrion-flies in the other. Wasps seem partial to orange flowers, and humming-birds to red ones. A connection of predominating flower-colours with latitude—reds being most tropical, blues less so, and yellows and whites more polar—coupled with the opening of flowers in spring and summer in order of colour—blues on an average first, then whites, purples, yellows, reds—suggests a close connection between floral colour and the intensity of the sun's light. The whole subject has, however, been the theme of more hasty guesses than sober investigations.

Colquhoun, JOHN (1805–1885), a noted Scottish sportsman and writer on sport, born and educated in Edinburgh. Among his writings are *Moor and Loch*, *Rocks and Rivers*, *Salmon Casts and Stray Shots*, and *Sporting Days*.

Colquhoun, PATRICK (1745–1820), a London police magistrate, born in Scotland where he was Provost of Glasgow in 1782. As a London magistrate he was very active in advancing social reforms, and wrote a great deal on such subjects. Among his works are *Police of the Metropolis*, and *Population, Wealth, Power, and Resources of the British Empire*.

Colt, SAMUEL (1814–1862), an American, noted as the inventor of the revolving pistol. He was born at Hartford, Connecticut, and as a boy ran away from his father's silk factory and went to sea for one voyage, during which he made a model of his pistol. On his return he learnt chemistry and lectured upon it for two years in order to raise money to carry out his invention. The first effort proved a commercial failure, but in 1847 the government ordered 1,000 for the Mexican War, and the general adoption of the patent throughout the world made the venture a thorough success.

Coltsfoot (*Tussilago Farfara*), the only British species of a small genus of composite plants, is a common and often troublesome weed on clay, or even on bare chalk. Its flowering scapes, with yellow flowers and imbricate bracts along the peduncle, appear very early in spring, and are followed by a large pappus and by the broad angular leaves which are cottony below. This cotton, soaked in saltpetre, was formerly used as tinder. The leaves are used as a remedy for coughs and asthma, either smoked or infused, *tussilago* meaning "cough-allayer." The leaves are often spotted with orange patches of a pretty little fungus, the coltsfoot cluster-cup, *Æcidium tussilaginis*.

Coluber, a Linnæan genus of snakes, which included the venomous and non-venomous Colubrine Snakes. [SNAKES.] It is now greatly restricted and is the type of a universally distributed family (Colubridæ), to which the English Ringed Snake (q.v.) belongs. The best known species of the genus is the Æsculapian or Schlangenbad Snake (*C. æsculapii*), widely distributed in Europe.

Columba, ST. (521–597), is thought to have been born in Donegal of a family of Irish royal blood. He was ordained and took monastic vows, and founded two monasteries in Ireland, one on Lough Foyle, the other in Leinster, known later as Derry and Durrow respectively. Somewhere about 560 he went on a mission to Scotland, and King Conal, his kinsman, gave him the island of Iona, where he built a church and monastery, and made preparations for the conversion of the Picts. Beginning with Ness, the King of the Picts, he soon succeeded in converting all north Scotland, and founded many monasteries, the whole of the northern Picts paying ecclesiastical obedience to the Abbey of Iona. The Scots of Britain and Ireland honoured St. Columba as much as did the Picts, and it was he that crowned Conal's successor Aidan as king. He also accompanied the king to Ireland in 590 when a council was held in Ulster to settle a dispute between the King of Ireland and the King of the Scots. When he felt death approaching he went to a hill above the monastery to give it his farewell blessing, and then returned to his cell to go on with the transcription of the Psalter, the last words he wrote being, "They that seek the Lord shall want no manner of thing that is good." At the midnight service of the next day —Sunday—he sank down before the altar and quietly died.

Columban, ST. (Columbanus) [550–615], an Irish monk of Leinster, who was educated at Bangor in Down. In 590 he went with others to the Vosges and founded the monasteries of Luxeuil and Fontenay. He was accused before a synod of French bishops in 602 for unorthodox practices as to the keeping of Easter, and having given offence at Court by rebuking Thierry II. of Burgundy and Brunehart, he was banished, and preached for a time in Switzerland. Driven from there he went to Italy, where he founded at Bobbio the monastery in which he died. He appears to have been acquainted

with the Latin and Greek classics, and among his writings are some Latin poems. His works were published at Louvain (1667).

Columbia, a name of widespread use in the United States of America. 1. The chief is the District of Columbia, the seat of the Federal Government. This was made the seat of government under a law of Congress in July, 1790, and consists of a district of 64 square miles at the junction of the Potomac and Rock Creek, one of its affluents. It is well wooded and has some delightful scenery, and is very productive of grain and vegetables. The capital is Washington, which contains the Capitol, and has been the seat of the central government since 1800. The United States navy yard here is one of the best appointed dockyards of the country. The territory is under the control of Congress, and municipal affairs are administered by commissioners appointed by the President and Senate. The district has no elective franchise, and consequently no representative in Congress. Another important town is Georgetown, which is connected with Cumberland in Maryland by the Chesapeake and Ohio Canal. There are two universities and many schools and churches in the district. 2. The capital of South Carolina, of which it is the chief seaport, on the E. bank of the Congaree, 124 miles N.W. of Charleston, to which, in other respects than political, it ranks as second. It was almost destroyed during the Civil war.

Columbia, British, a mountainous district of North-West America, forming, with Vancouver Island and Queen Charlotte's Islands, since 1871 a province of the Dominion of Canada. It lies between the 60th parallel of N. latitude and the United States on the south, and between the Rocky Mountains on the east and the Pacific on the west. The country is chiefly occupied by forest-clad spurs of the Rocky Mountains, which develop in the west into the Cascade Range, interspersed with fertile valleys which are more fitted for pasturage than for conversion into arable land. Till comparatively lately the country was little known, save to the men of the Hudson's Bay Company, but the discovery of gold gave an impetus to immigration, and led to the fuller study of the capabilities of the district. Since the establishment of a transcontinental Canadian Railway, British Columbia bids fair to become an important entrepôt of trade between Canada (and so Europe) and China and Australia. The mineral wealth of the country is great. though as yet little developed, and coal has been found both on the mainland and on Vancouver's Island. The forests also have hitherto been little interfered with, but the timber trade will probably become important. Most of the gold yet worked has been from alluvial deposits, especially along the course of the Stickeen river. Of the other rivers, which are necessarily short in course and full of falls and rapids, the most important is the Fraser, which has a course of 800 miles and falls into the Gulf of Georgia between Vancouver Island and the mainland. The principal heights of the Rocky Mountains in British Columbia are Mounts Brown, Hooker, and Murchison, which average 16,000 feet. Fish is abundant on the coast and in the rivers, and much salmon-tinning is carried on. Esquimault on Vancouver Island is the chief station of the Pacific squadron, and possesses repairing docks.

Columbia College, New York City, was founded in 1754 under the name of King's College by the Crown, on the model of a college at one of the English universities, already introduced at Harvard (q.v.) and Yale. The name was changed at the Revolution. It is now a university granting degrees under a charter from the State legislature, and is governed by a board of trustees elected by cooptation. It is not residential, but (like University College, London) provides instruction only, many students living at their own homes. It is one of the richest of American universities, having valuable landed estates in New York City. Important offshoots from it are the "School of Mines," an important technical school of applied science, and the School of Political Science, whose organ, the *Political Science Quarterly*, contains matter of much value. Anthon (q.v.) was for many years a professor, but it has since numbered scholars and scientific men of greater eminence on its staff, among them the authors of the Latin dictionary most esteemed in England at present.

Columbia River rises on the western slope of the Rocky Mountains in British Columbia, and, after flowing with an irregular, generally south-west course, flows west and then north-west, forming for some distance the boundary between Oregon and Washington states, falls into the Pacific, having Pacific City in Washington on the north side of the estuary, and Astoria in Oregon, on the south. Its bar and many rapids render navigation difficult, though these difficulties in some measure are surmounted by the means of short railways which make the *portage*. The Columbia is chiefly noted for the abundance of its salmon, which are largely tinned and exported.

Columbidæ. [Dove, Pigeon.]

Columbine (*Aquilegia*), a beautiful genus of *Ranunculaceæ*, natives of the north temperate zone. They have elegant bi-ternate or tri-ternate leaves and drooping polysymmetric flowers with five petaloid sepals, five petals, each with a long spur, indefinite stamens, and five carpels forming a ring of follicles. In the one British species, *A. vulgaris*, the spurs being incurved have been compared to five doves' heads, the sepals being their wings, whence the name Columbine. In cultivation. the flowers vary much in colour, and are often doubled. Several American species and hybrids are now grown with very long spurs and beautifully contrasting colours in the calyx and corolla.

Columbine (Ital. *dove-like*), in the popular improvised comedy or *commedia dell'arte* of Italy [Comedy], is the ladylove of harlequin, who is usually kept from him by fate or her cruel father (pantaloon). This comedy is the origin of the harlequinade of the English pantomime. Both harlequin and columbine in the latter are chiefly remarkable for their dancing.

Columbite (also called *Niobite*), a rare mineral consisting of oxides of iron, tantalum, and niobium, which occurs in but few localities. It is of an iron-grey colour, of sp. gr. about 6, and crystallises in the rhombic system.

Columbium. [TANTALUM.]

Columbus, in Franklin county, is the capital of the state of Ohio in the United States of America, and is on the Scioto, a tributary of the Ohio, 100 miles N.E. of Cincinnati. Its situation in an extensive plain is very pleasant, and its broad tree-shaded streets are well laid out. There are many fine public buildings, among them the Capitol, with a rotunda 150 feet high. The manufactures are various and numerous, but of no great special interest. Columbus is well provided with railways, and is served by a branch of the Ohio Canal.

Columbus, CHRISTOPHER (1436–1506), a Genoese navigator, who is generally credited with the discovery of America. His father was a woolcomber, but the son went to sea at the age of fourteen, and led a somewhat adventurous life, taking part in sea-fights, and eventually arriving in Portugal, where he married the daughter of an Italian navigator. Here he studied the maps and charts of his father-in-law, and seems to have let his mind dwell upon the romantic stories then afloat of wondrous lands to be found out in the western seas. He travelled to the north as far as Iceland, and there he may have heard the stories of Norse adventurers, who had discovered lands to the west. However this may be, he had in 1474 formed the design of discovering a western passage to India, and cast around for someone to patronise and pay for the venture. For some time he did this in vain. Kings and nobles alike held aloof, and when he finally applied to Ferdinand and Isabella he was for a time unsuccessful, partly owing to the preoccupation of the king and queen, who were in the middle of the war with the Moors, and partly to Spanish jealousy. It was not till 1492 that he finally was able to set sail in the *Santa Maria*, accompanied by the smaller ships *Pinta* and *Niña*. On September 26th he started from the Canary Islands, and the trouble he encountered owing to the ignorance, superstition, and timidity of his crews, is matter of universal knowledge. On the 11th of October he saw a light ahead, and on the next day made one of the Bahamas, going on to Cuba and Hispaniola (now Hayti), where the *Santa Maria* ran aground and was lost. In September, 1493, the two remaining ships arrived on the same day in port, though they had lost sight of each other a month before. They brought back specimens of the productions of the newly-discovered lands in the shape of gold, plants, birds, animals, and six natives. Columbus was received with honour, being made Admiral of the Sea, and Grandee of Spain. In the autumn of the same year he set out upon his second voyage, in the course of which he discovered Dominica, and made an effort at colonising. But though a good and bold sailor, he was a poor coloniser, and a bad commander of men. He was much aided by his plucky brother Bartholomew. He returned to Spain in 1496, and incurred the anger of the queen for having enslaved the natives. In this respect he was no worse than Sir John Hawkins and other English adventurers of a later date. In 1498 he made his third voyage in which he penetrated to the mainland. Meantime the jealousy of the Spaniards had made head against him, and through an overstraining of the royal commands, the governor of the colony sent the two brothers Columbus home in chains. The queen at once released the brothers, and received them back into favour, but the indignity had sunk into Christopher's heart, as he bitterly spoke of "the rewards of service," and he was never the same man again. In 1502–4 he made another voyage of exploration along the south coast of the Gulf of Mexico, and endured much hardship. He died at Valladolid in 1506. His remains were afterwards moved to Seville, and then, along with those of his son Diego, to Hispaniola, to be once again, at a much later date when Hayti became French, moved to Havana. Besides his brother Bartholomew, and his eldest son Diego, both of them men of mark, there was a brother Giacomo. Columbus seems to have been a curious mixture of enthusiastic dreamer and practical man, of almost ascetic devotee and intrepid mariner, a type not so rare, perhaps, then as now.

Columella, L. JUNIUS MODERATUS, a first-century Roman writer upon agriculture, being the contemporary of Seneca. He travelled much, and seems to have visited Gades, Tarentum, and Sardinia, but chiefly resided at Rome. He wrote twelve books *De Re Rusticâ*, one, in dactylic hexameters, being chiefly upon gardening. He also wrote a supplementary treatise upon trees—*De Arboribus*. The best edition of his works is that of Leipzic (1794–97).

Column, in architecture, a rounded pillar with a base, shaft, and capital (q.v.). Occasionally a column stands alone as a monument (as in the Nelson column in Trafalgar Square), or is a purely ornamental adjunct to a building (as in the Taylorian Institution at Oxford). In Gothic and Norman architecture a column usually supports one side of an arch, in classic architecture the entablature (q.v.). In military language, the column is the formation of the army when marching or manœuvring.

Colvin, SIDNEY, born at Norwood in 1845. He entered at Trinity College, Cambridge, where he gained the Chancellor's Medal for English verse, and graduated as third classic, and became Fellow in 1869. In 1873 he was appointed Slade professor of Fine Arts, and became director of the Fitzwilliam Museum in 1876. In 1884 he was appointed Keeper of Prints and Drawings at the British Museum. He has written a good deal, among his works being Lives of Landor and Keats for the *English Men of Letters* series.

Colza (*Brassica campestris oleifera*), a variety of the rape, grown for the sake of the oil expressed from its seeds, chiefly in France, Germany, Russia, and India. Colza oil was formerly largely used in

lamps, but is now superseded to a great extent by the cheaper petroleum oils.

Coma (Gk. *kōma*, deep sleep), is a condition of unconsciousness occurring in certain forms of disease, which differs from sleep in that the patient cannot be aroused. In the slighter forms of coma the phenomena are closely allied to those of sleep; signs of deepening coma are the development of stertorous breathing, with puffing of the cheeks, the involuntary passage of the evacuations, and impairment of reflex movements. Death, if it occurs, is usually preceded by marked changes in the character of the pulse and respiratory movements, in some instances by considerable rise of temperature. Coma may supervene upon injuries to the brain produced by violence, or resulting from disease within the cranium. The sudden onset of coma usually points to a vascular lesion. [Apoplexy.] Epilepsy is one of the most common causes of the development of the comatose condition. Again, coma may occur in fevers, and may be produced by certain narcotic poisons (especially opium (q.v.) and alcohol), or by the accumulation of morbid poisons within the animal body, as in the condition known as uræmia, or in diabetes. The diagnosis of the cause of coma is oftentimes fraught with extreme difficulty. In many instances the most carefully conducted examination of the patient fails to warrant any definite conclusion, and time alone can be expected to reveal the cause of the mischief. There may be evidence of some head injury, or poisoning may be suspected, in which case the stomach pump must be employed; the existence of paralysis [Hemiplegia] may throw light on the matter, and the ophthalmoscope and stethoscope, and in some instances an examination of the urine, may clear up the diagnosis. The greatest caution, however, is necessary in drawing conclusions, even in cases where any data can be discovered to start from. The treatment of coma depends mainly upon its cause, and is, therefore, obviously beyond the scope of the present article.

Comacchio, a walled town of Italy, 30 miles S.E. of Ferrara, on the sea-side of an island in the east of a lagoon about 90 miles round, shut out from the Adriatic by a belt of land three miles wide. It is the seat of a bishopric, and has several churches, and a Capuchin convent. The chief industries are salt-works and fisheries, the fry of eels and grey mullet being let in by canals and kept in by nets. Tasso and Ariosto both mention the fish of Comacchio.

Comayagua, a city of Honduras, in a wide fertile valley, 1,935 feet above the sea level, 190 miles E. of Gautemala upon Rio Humuya. It was founded in 1540, but has suffered much from the political commotions of the country. It was the capital down to the year 1880.

Comb, a fleshy crest, usually brightly coloured, seen to most advantage in gallinaceous birds [Sexual Selection, Wattle], and more fully developed in males than in females.

Comb. The shape of the comb is probably suggested by that of the backbone and projecting ribs of the fish, which was probably the first tool which supplemented the primitive use of the fingers in dressing the hair. Combs were used by the ancient Assyrians and Egyptians, those of the latter being of wood and toothed on one side only. The Greek combs were toothed on both sides and made of boxwood from the shores of the Euxine. In shape they resembled the modern fine-tooth comb. Ivory combs were also used both in Egypt and in Greece. Valuable combs ornamented with jewels are preserved from Byzantine and mediæval times. Many of them are in the treasuries of Continental churches, and were intended for use by the priests before saying mass. High "back combs" have at times been an important feature in feminine attire. They reached their highest altitude some sixty years ago in France, when the towering back hair surmounted by a high ornamented comb was known as the *peigne à la giraffe*. Modern combs are made of boxwood, tortoiseshell (or rather turtleshell from the Pacific), horn, ivory; the guttapercha comb (made in a mould) was invented by Goodyear, an American, about 1850; more recently combs have also been moulded from celluloid (q.v.).

Combassou, a dealers' name for the ultramarine or steel finch (*Fringilla ultramarina*). The males in full plumage are blue-black with metallic lustre.

Combe, Andrew (1797–1847), M.D., physician and physiologist, born at Edinburgh, where he studied medicine, going afterwards to Paris to study in the medical schools there. In 1823 he practised in Edinburgh, but weak health proved a formidable obstacle. In 1836 he was appointed physician to the King of the Belgians, and in 1838 physician to Queen Victoria. For his health's sake he made voyages to Madeira and elsewhere, and embodied his views of the ship accommodations of that day in a paper upon *Ship Fever*. Among his other works are *Mental Derangement* (1831); *Physiology* (1834); *Digestion* (1836); *Infancy* (1840).

Combe, George (1788–1858), brother of the above-mentioned Dr. Combe, was born at Edinburgh, and educated at the High School and University there. He was writer to the Signet from 1812 to 1837, when he devoted himself to phrenology and education. He attended the lectures of Spurzheim, and after being a thorough disbeliever in his principles, became an ardent disciple, and made the condition of man in relation to external objects a special study. He travelled and lectured and established schools for carrying out his ideas. Besides his *Essays on Phrenology* and his *Elements of Phrenology*, he wrote upon social subjects.

Combe, William (1741–1823), born at Bristol, is chiefly known as the author of *Dr. Syntax's Tour*, which again owes most of its reputation to the illustrator. Educated at Eton and Oxford, he inherited a small fortune, which he soon dissipated in a life of adventure. He wrote many works which are now little known and less regarded.

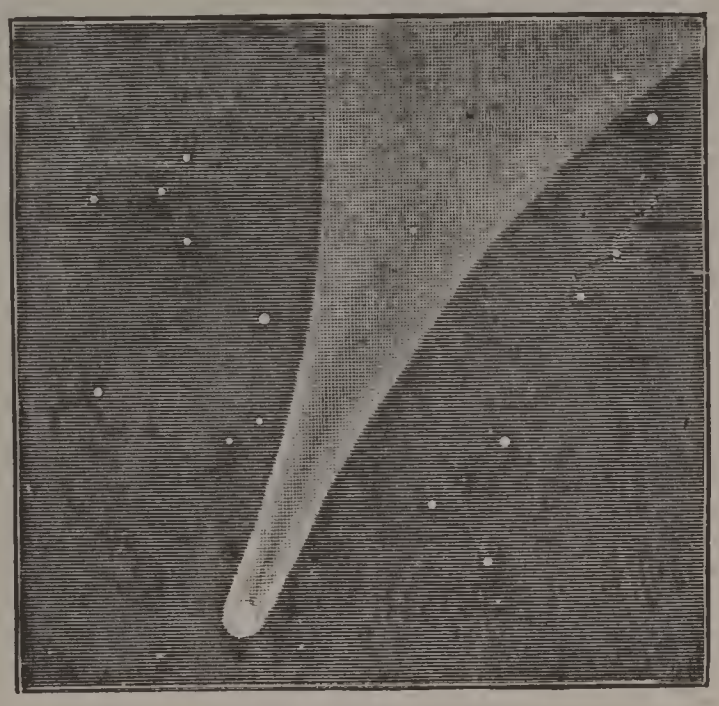
Combermere, STAPLETON COTTON, VISCOUNT (1773-1865), was the son of a Cheshire baronet. He was educated at Westminster, and entered the army in 1790. In 1794 he was in India and had become lieutenant-colonel. In 1808 he was in the Peninsula, a major-general, and in 1810 he was commander of the cavalry. He took part in the battle of Talavera and many others; and in 1814 was created Baron Combermere. From 1817–1820 he served in the West Indies, from 1822–25 he was in Ireland, and from 1825-30 in India, where he was present at the taking of Bhurtpore—a siege familiar to readers of that quaint old book *John Ship*. In 1827 he became viscount, and in 1852 succeeded the Duke of Wellington as Lieutenant of the Tower. He was made field-marshal in 1855. He retained a wonderful vigour and activity till extreme old age, owing in a great measure to his abstemiousness and his great power of self-control.

Combinations, in *Mathematics*, the number of different groups of articles that can be selected from a given quantity, each group to differ in its constitution from every other group. Thus it is a question of combinations to discover how many different hands of whist are possible with the ordinary pack of fifty-two cards. [PERMUTATION.]

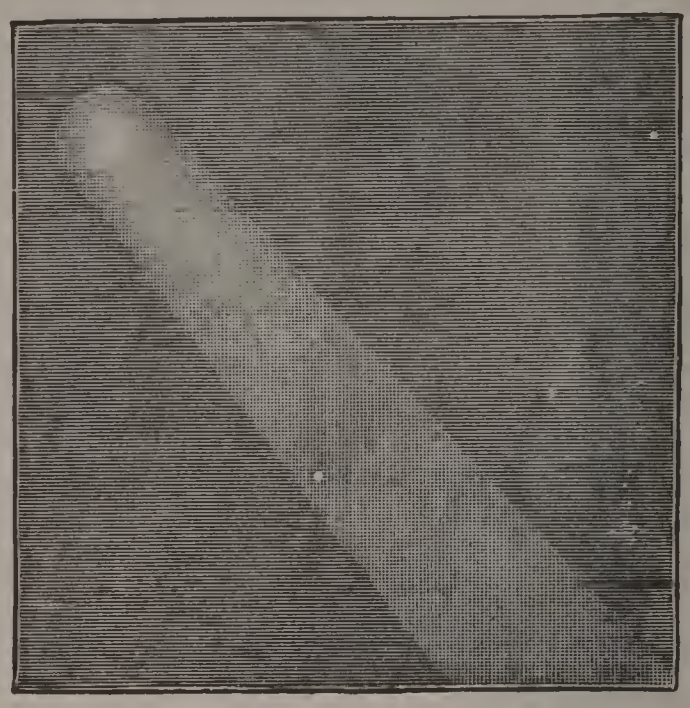
Combinational Tones. When two notes are sounded together a third note will be faintly heard whose frequency is the sum of the frequencies of the two given notes; this is called the *summational* tone. Also a fourth note will be produced whose frequency is the difference of the frequencies of the two given tones; this is the *differential* tone. Thus c' (256 vibrations per second) and g' (384) give e'' ($= 640 = 256 + 384$). They also give c ($= 128 = 384 - 256$). These two extra notes are called combinational tones.

Combustion signifies any chemical reaction in which combination occurs, and which is attended by the production of much heat. Ordinarily, however, the term is restricted to those cases in which the heat evolved is so great as to render the reacting bodies, or products of the reaction, luminous. All cases of *burning* are instances of combustion. In the case of combustion in air the effect is due to combination with the atmospheric oxygen. The early history of chemistry was for the greater part a history of combustion, and the first comprehensive chemical theory was a theory of combustion—the phlogiston theory, enunciated by Stahl. [PHLOGISTON.] Though held by chemists for over sixty years, it was completely demolished at the end of the last century by Lavoisier. This eminent French chemist proved the composition of air to be a mixture of the two gases oxygen and nitrogen. He showed that the latter played no active part in the phenomena of burning, the oxygen alone being concerned. He afterwards demonstrated conclusively that the essential nature of the reaction was the combination of the constituents of the burning substance with the oxygen of the air.

Comedy (Greek, literally, *village-song*). Like tragedy (q.v.), comedy arose in connection with the worship of Dionysos (Bacchus). At the village festivals of Bacchus in early Greece, especially at the vintage, bands of revellers used to stain their faces with the wine-lees and go about jeering and mocking at everyone they met. With excitable, imaginative people like the Greeks, this involved much expressive gesture and impersonation. This spontaneous revelry in course of time acquired a regular plan. We hear of a rudimentary comic drama in Sicyon in the 7th and 6th centuries B.C., and somewhat later in Megara (in both these towns there was bitter political feeling between nobles and people, which found expression in their comedy); and in Sicily at Syracuse [EPICHARMUS] about 500 B.C., where, as the existence of a despotism prevented political satire, parodies of the myths and sometimes of the doctrines of philosophers (*e.g.* the Pythagoreans) seem to have been in vogue. Athens' comedy was originally derived from that of its neighbour Megara. As tragedy (q.v.) developed comedy imitated it, adopting its structure, its metres (to a great extent), and its chorus; and, being especially an amusement of the masses, it grew with the growth of democracy after the Persian wars. Of Crates, Cratinus, and Eupolis (456–420 B.C.) we have only fragments. Our knowledge of the Athenian comedy of this—its first and best—period is derived almost wholly from ARISTOPHANES (q.v.), whose first play was produced in 427, his last in 388 B.C. His attacks are chiefly on the democracy of Athens, the "new learning," and the new subversive notions in philosophy and religion. During the troublous times at the end of the Peloponnesian war political satire was dangerous, and his last play, the *Plutus*, deals with a social subject—the desire for wealth. Moreover, the increasing poverty of Athenian society had made it difficult to mount the plays properly or furnish choruses. [DRAMA.] The example set in the *Plutus* was followed in other plays, which collectively are classed as the Middle Comedy, and seem to have satirised social types rather than persons—the miser, the timid man, the swaggering warrior, and so on. Fragments only are left. Literary education and ethical speculation had probably disposed society for this sort of satire. As political interest decayed in Greece (after Alexander's conquests), this type passed into the New Comedy or Comedy of Manners, of which Menander, imitated by Plautus and Terence in Latin, is the best known writer. A kind of rustic Roman comedy, the *fabula Atellana* (originally written in the Oscan dialect), was probably suggested by Sicilian comedy. The Roman regular comedy of Plautus and Terence was almost a direct translation from the Greek; by its side, however, were the "Atellane fables" and the *mimes*. The latter, probably a purely native institution, are farcical representations, often decidedly broad in character, of some ludicrous incident. They had fixed characters—a clown, a heavy father, "chatterboxes," etc., but the dialogue was largely *extempore*. Probably, while there was little regular comedy written after 100 B.C., representations akin to the mimes continued in Italy through the later Roman Empire and the Middle Ages until the Renaissance.

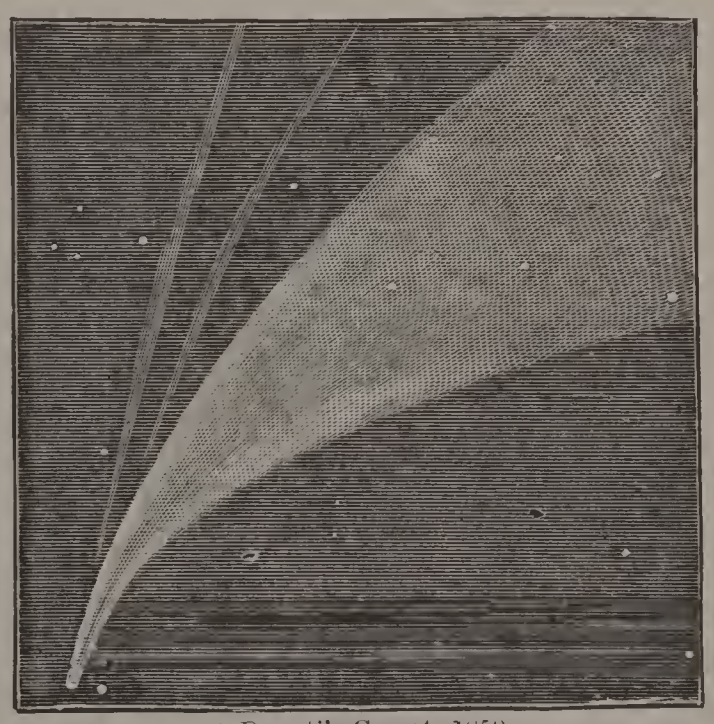


1 The Comet of 1811.

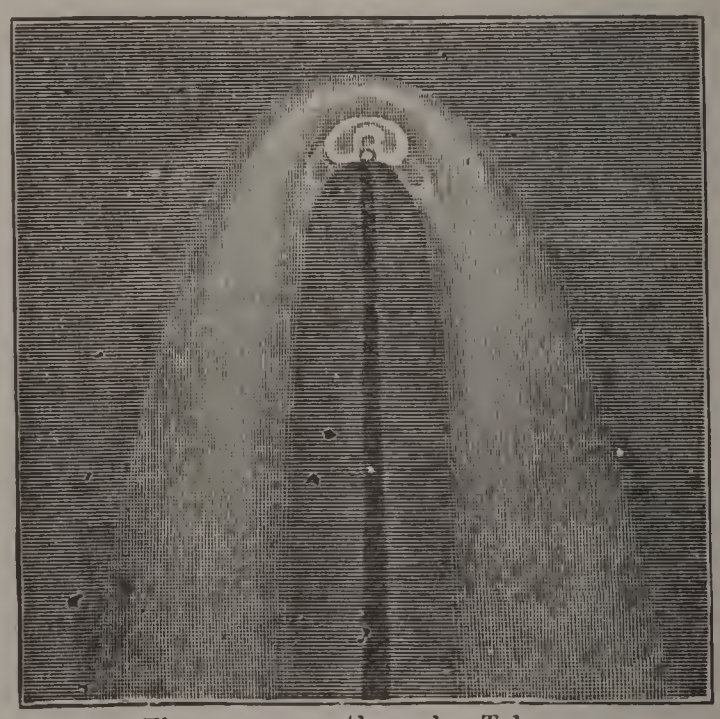


2 Halley's Comet, 1835.

3 The Great Comet of 1843.



4 Donati's Comet, 1858.



5 The same, seen through a Telescope.

"Mimi" and "joculatores" (*jongleurs*, jugglers) are mentioned both in England and abroad by mediæval authors, and the popular *commedia dell' arte* of Italy, with its fixed characters (harlequin, columbine, pantaloon, etc.) and improvised dialogue, the parent of our pantomime, is probably derived from this mediæval comedy. But the comedy proper in modern times begins about the end of the 15th century. Farces were written during the Middle Ages, and a French one (long afterwards revived as *L'Avocat Pâtelin*) was produced in 1490. In Germany, too, there were farcical "carnival plays," of which Hans Sachs is the best known author. But both in Italy and Spain at the Renaissance dramatists began to give to these popular farces the conventional structure and characters of Plautus and Terence. The earliest modern comedy, according to Hallam, is the *Calandra* of Bibbiena, based on a play of Plautus and produced at Venice in 1508. An early Spanish piece is of about the same date. But Ariosto (1474–1533) may be taken as the parent of modern comedy. Two comedies by him in Italian have the conventional Terentian characters, but one has an original plot. It had long been the custom for schoolboys or University students to perform Latin plays on special occasions; and the first English comedy was written for performance by Eton boys by Udall, while headmaster, between 1534 and 1541. In France—somewhat as in ancient Greece—the rude popular farce was first converted into comedy proper by Molière (q.v.) in the seventeenth century, who in his verse comedies combined the humour and licence of the farce with the strict versification introduced for tragedy by Malherbe, and who, like the writers of Middle Comedy of Greece, satirised social types. To trace the evolution of modern comedy in England would require a considerable volume; it passes through under the hands of Ben Jonson and Shakspeare, away from the fixed incidents, conventional characters, and dramatic unities that had come down from ancient Rome, to the refreshing licence and endless variety in all these matters that we find, for instance, in the *Merchant of Venice;* and through the witty but licentious comic drama of the Restoration to the lifelike if somewhat limited work of Goldsmith, Sheridan, and the Colmans at the end of the last and beginning of this century, and latterly to the serious "comedy with a purpose" of would-be dramatic reformers of to-day. Comedy can only be distinguished from farce historically. It has much more plot; the characters vary; each is marked by a special predominance of some one quality; the incidents are run into a knot, which is untied at the close of the play. These characteristics (adapted from Professor Henry Morley's criticism of Ben Jonson) may serve as the basis of a definition. They will not, however, apply to the earliest plays of the Greek comedy.

Comenius, John Amos (1592–1671), an educational reformer of Moravia. Educated at Herborn and Heidelberg, he became a wanderer, but settled for a time at Lissa, in Poland. He was invited to England to superintend education, but the Civil war drew attention to graver matters, and he went to Sweden in 1641 at the invitation of the Chancellor Oxenstiern. He went back to Lissa in 1648, from there to Hungary, and then to Amsterdam, where his books were published (1657). Besides his *Didactica Magna*, *Janua Linguarum reserata*, *Vestibulum*, he wrote a kind of *Cyclopædia*, and is said to have edited the first *Children's Picture Book*.

Comets form a special class of heavenly bodies remarkable in many ways. They exist in great numbers, though it is only occasionally that they present an appearance to the unaided eye of an observer of the heavens. Records of such appearances are given in history, much fear and anxiety attending them during their short visits. But since more has been learnt of the nature of comets, and especially since the approximate time of the appearance of such a comet as happens to be a periodical visitor has been predicted by astronomers, much of the superstitious dread attaching to them has been removed. For it is the unexpected that alarms people, and comets are now no longer unexpected, though so far as their exact nature is concerned very little is known, and much still remains to be discovered.

The path of motion of a periodic visitor to our solar system is elliptic, the sun lying at one focus of the ellipse, and exerting a sufficient gravitational force on the body to prevent its rushing off never to return. But if the speed of the body could be accelerated when it is at *perihelion* or minimum distance from the sun, the path of motion would be a longer ellipse, and the body would take longer time to complete its orbit; and if the speed were increased to a certain definite degree, the intensity of gravity would be just insufficient to bring the body back to its starting point, the ellipse would extend to infinity, and we should get a parabolic orbit. Such a body, reaching its perihelion with such a speed, would take infinite time to accomplish its orbit, and would only visit our system once, departing then for ever. Further, all bodies with speeds greater than their corresponding critical speeds would describe hyperbolic curves and would similarly visit our system once only.

The orbits of comets afford instances of all three types, elliptic, parabolic, and hyperbolic. In most cases the elliptic orbits of our regular visitors are so gigantic that they are practically parabolic. Comets, whose orbits are hyperbolic, cannot have acquired their speed by reason of the sun's attraction only, otherwise they would describe parabolas. The effect of the attraction of the solar planets upon comets has also to be considered in the investigation of their motions. Perturbations are in this way produced which materially alter a comet's path; the converse perturbations, due to the reciprocal action of the comet upon the planets, are extremely small, and practically produce no effect in the elliptic orbits of the planets, for the mass of the comet is exceedingly small.

Another observed effect is that of the slight retardation of a comet as it rushes round the sun at perihelion. The period of Encke's comet is diminished by $2\frac{1}{2}$ hours on this account each time it

effects a complete circuit round the sun; it is due apparently to some sort of frictional resistance in the medium surrounding the sun, as though the latter possessed a material envelope of extreme tenuity extending for millions of miles from its surface.

Comets vary considerably in appearance. (*See* vol. ii. p. 193.) There is generally a bright centre or *nucleus*, surrounded by fainter layers that stretch away into a sweeping tail of varying luminosity, and of such exceeding thinness that the brilliancy of a star when seen through a comet's tail seems unimpaired. It is observed that the tail of a comet, if it possess one, is always directed away from the sun. The mass of a comet is so slight in comparison with that of the heavenly bodies, whose masses we are able to compare and directly estimate, that no satisfactory means have been devised to obtain a numerical value thereof.

It is supposed that the nucleus consists of disconnected meteoric fragments, and that the tail consists of iron or chlorine, hydrocarbons, and hydrogen. Proximity to the sun probably volatilises part of the material available for the tail, and this is dissipated by subsequent visits to the sun till no more material remains to renew that which has frittered away. The comet is then tailless. The light of comets may be due to electric discharges, to reflected solar light, and to incandescence of its ingredients. The repulsion of the tail from the sun seems to demand an electrical explanation. Twenty periodical comets are known, the more important of which are here tabulated :—

Comet.	*Period.*	*First Obs.*	*Next passage.*
Encke	3·3 years.	1786	1894
Faye	7·4	1843	1895
Tuttle	13·8	1858	1899
Halley	76	B.C. 11	1910
Biela	6·6	1772	probably scattered.

Besides these there are other comets worthy of notice. The 1811 comet was very brilliant; it describes an elliptic orbit of enormous dimensions, its maximum distance from the sun being about 40,000 million miles. Views of the great 1843 comet and of Donati's 1858 comet are given in the plate. The former approached dangerously near to the sun; its minimum distance from that body was only 32,000 miles. Its tail was over 200 million miles in length, and its orbit has since been followed by the 1880 comet. The earth passed through the tail of the great 1861 comet, but without any harm being done by the passage. Very many similar appearances have been observed, and their structure examined by telescope and spectroscope.

Comfrey, the English name of the boraginaceous genus *Symphytum*. They are rough perennial plants, having a cooling taste like borage and scorpioid inflorescences of cylindrico-tubular flowers, cream-coloured, purple, or blue. There are two British waterside species, and a third, *S. peregrinum*, probably a cultivated hybrid between the British *S. officinale* and the Caucasian *S. asperrimum*, has been introduced as a forage-plant under the name Prickly Comfrey. It grows freely, even in stiff clay, and proves a most valuable winter fodder, especially for horses.

Comines, a French town in the department of the Nord and arrondissement of Lille, 15 miles south-west of Courtrai, and upon the river Lys, which forms part of the French and Belgian frontier, and divides the town into two parts, one of which is Belgian. There are some manufactures. The town is the birthplace of Philippe de Comines (q.v.).

Comines, PHILIPPE DE, SIEUR D'ARGENTON, a French statesman and historian of Flemish extraction, and born at Comines in 1445. He went to Burgundy and rose into high favour with the then Duke and his successor, Charles the Bold, with whom his name is more generally associated. He was sent on various missions to France, England, and Spain. When Louis XI. made his imprudent visit to Charles the Bold at Peronne, De Comines had much to do with calming down the duke's anger. Scott has given a graphic account in *Quentin Durward* of the transactions of the king and the future historian. In 1472 De Comines forsook the court of Burgundy for that of France, and Louis XI. rewarded him with the fief of Talmont. Under Charles VIII. he was deprived of his possessions and imprisoned, but was liberated, and took part in Charles's Italian expedition, during which he had an interview with Machiavelli. He was in favour with Louis XII., who rewarded him with office and pension. He died in 1509. Of the seven books of his *Memoirs*, six are taken up by the affairs of Louis XI., and the seventh deals with Charles VIII. in Italy. There are also his *Lettres et Négotiations*.

Comma Butterfly (*Polygonia albus*), a species of Butterfly found in England, and recognisable by the white *c* marked on the under side of the hind wings. It belongs to the family Nymphalidæ (q.v.).

Commandant, a commanding officer, *e.g.* the military governor of a town, district, or corps in some cases; a term often used in English in speaking of foreign garrisons.

Commander, in the British navy, one holding rank between that of a lieutenant and that of a post-captain. The rank of "master and commander" was established in the latter half of the 17th century, and its holders have ever since received the courtesy title of captain. Commanders serve either as captains of sloops, corvettes, and vessels not important enough to be commanded by a post-captain, or as chief executive officer under a post-captain in a large ship. Promotion to the rank is by selection, and the full pay is £1 a day.

Commander-in-Chief. In the United States the command of the army and navy is vested by the Constitution in the President. In England, however, the functions of the Crown being constitutionally exercised through ministers, the administration of the army is delegated to the Secretary of State for War, under whom is the Commander-in-Chief (sometimes a royal duke), the head of the active branch of the service, charged with the supreme command of the army at home, the superintendence of enlistment, the

arrangements for promotion, and the distribution of rewards subject to approval by the Crown. The term is also applied to the commander of a detached portion of the forces, as in a colony. A colonial governor, though a civilian, usually has the supreme civil command of the forces of his district vested in him.

Commemoration, THE, of Founders and Benefactors of the Oxford University, or ENCÆNIA, takes place annually in the Sheldonian Theatre at Oxford on a Wednesday during June (usually determined by the date of Easter). After a Latin oration in praise of past benefactors, the honorary degree of D.C.L. is conferred on various eminent strangers, and parts of the prize exercises in Latin, Greek, and English poetry and prose are recited by the successful competitors. The festival is always the occasion of a good deal of noise and banter, usually witty, on the part of the undergraduates present. In 1871, however, the noise, owing to the presence of a M.A. in a red tie, was so great that the proceedings were abruptly closed, and since then the undergraduates have been admitted only by ticket and distributed among the ladies in the various galleries, instead of sitting in the highest gallery by themselves. The festivities—a procession of boats, "Show Sunday," college concerts, balls, etc.—in connection with it last about five days. The corresponding festival at Cambridge is the "Commencement," but the bulk of the festivities at Cambridge takes place in the "May week" of the college boat-races.

Commensalism, also known as CONSORTISM or MUTUALISM, is that form of symbiosis in which two organisms (either both plants, both animals, or a plant and an animal) live together on terms of mutual advantage. One of the most striking instances is that of the lichens (q.v.) formerly thought to be autonomous organisms, but now recognised as consisting of one of the lower algæ enclosed in the thallus of a fungus, generally ascomycetous. The alga (gonidium) is kept moist, whilst the fungus is nourished on the cast-off cell-walls of the alga. Another similar but even more startling case is that of the mycelia of *Elaphomyces*, a truffle, and the roots of many ordinary forest-trees, the fungus being supposed to aid in the assimilation-processes of the roots on the sloughing of which it lives. The close association of some hermit-crabs with sea-anemones is only one among multitudes of instances in the animal world; but perhaps the most remarkable are those involved in the correlation of animal and vegetable species. Thus we have flowers contrived in every detail to compel visiting insects to carry away their pollen, whilst the insect's proboscis and legs are modified for the same end and it is rewarded with honey or pollen. Species of *Acacia* have stipular spines hollowed for the abode of ants that protect the plant from other species of ants which are leaf-eaters, the protectors having also small glandular outgrowths on the points of the leaflets provided for them as partial board in addition to their lodging. Every gradation occurs between mutualist symbiosis and that which is one-sided in its advantages, *i.e.* parasitism (q.v.).

Commentrey, a town of France, in the department of Allier, is situated on the river Œil, by the side of extensive coal-fields, to which it owes its prosperity.

Commercial Traveller, the regular representative of a wholesale business house, travelling, usually with samples, to sell their wares to other business houses (usually retailers). They are essentially a modern institution, and probably, in the United Kingdom, number some 50,000. There are many valuable charities created for the widows, orphans, or disabled members of the body, and liberally supported by them, the Commercial Travellers' Schools at Pinner and the Commercial Travellers' Benevolent Institution being the chief, and, it need hardly be said, they are the mainstay of the smaller provincial hotels. Some ("town travellers") confine themselves to London or to some one other large town. The American term is "drummer."

Commination (Lat. *comminatio*, threatening), a solemn denunciation of God's anger and judgment against sinners, appointed to be read in the Anglican Church on the first day of Lent and at such other times as may be appointed. It was devised by the Reformers to replace the "godly discipline" of the mediæval Church, by which notorious sinners were formally expelled the Church on Ash Wednesday, and consists mainly of the penitential psalms and of certain passages from Scripture (from Deuteronomy xxvii., the prophets, and elsewhere). From the nature of the service it is sometimes absurdly said that Ash Wednesday is devoted to "cursing one's neighbours." The American Episcopal church omits the service.

Commissariat, the department of the army charged with providing food and supplies. Ancient and mediæval armies usually lived on the country which they happened to be invading; when in their own country the various commanding officers were responsible for their due provisioning. Even so late as the beginning of the last century troops were often provided with supplies through contractors with whom their commanding officers made arrangements, or commissaries-general were appointed on special occasions. A separate commissariat department for the British army was not constituted till 1793. Since 1870 the department has been merged in the Department of Control (q.v.).

Commission, an authority entrusted to any one. In the army it was originally applied to the warrant authorising an officer to raise, equip, and command a body of troops. It is now the warrant by which all officers, in the army from sub-lieutenant upwards, in the navy from lieutenant upwards, exercise their authority. A Royal Commission and a Parliamentary Commission are respectively bodies appointed by the Crown and either House of Parliament to investigate and report upon some subject—the relations between capital and labour for instance. The term is also applied to certain courts, *e.g.* the Irish Land Commission or the Court of High Commission appointed

under Queen Elizabeth, and abolished in 1641, to investigate ecclesiastical offences. *Special Commissions* are courts appointed by a special Act of Parliament to investigate and report on charges against particular bodies or persons. The Parnell Commission is a familiar recent instance. The "Commission of the Peace" is a term for the county and borough magistracy (excluding stipendiaries). From the practice in business of entrusting agents with goods to sell, etc., the payment made to such agents for their services has obtained the name of commission.

Commissionaires, CORPS OF, a body founded in 1859 by Sir Edward Walter for the purpose of giving employment to retired soldiers. They act as messengers or light porters, and number 1,882 (in 1892), of whom the large majority are employed in London. There are divisions in some of the provincial towns.

Committee, a body charged with some special work, usually a subdivision of some larger body, *e.g.* the Finance Committee of the London County Council. Frequently, however, the whole of one chamber of a legislative body "resolves itself into a committee" for special work, usually for an examination of details analogous to that performed by special committees; as when the House of Commons "goes into committee of supply" or examines the clauses of a bill in detail at its "committee stage."

Commodore. In the British navy a senior post-captain provisionally invested with the ordinary powers of a rear-admiral, but entitled to fly a broad pennant instead of a flag. Commodores are of three classes, and each wears a rear-admiral's uniform, with but very slight variations. The full pay of a commodore of the first-class is £3 a day, with allowances. In yacht clubs, and in the merchant service, commodore signifies chief captain, either by election or by seniority, as the case may be. In the United States navy commodore is not a provisional distinction, but a regular rank, intervening between rear-admiral and captain, and having attached to it a salary equal to £1,000 a year.

Commodus, LUCIUS AURELIUS, Roman emperor, was born in 161 A.D. at Lanuvium. He succeeded his father, Marcus Aurelius, in 180, and though brought up with great care he immediately gave way to every form of vice. Physically strong, he used to fight in the circus like a gladiator to show his prowess, and abandoned himself to gluttony and debauchery. Yet he assumed the title of Hercules Romanus, and sought to be worshipped as if he were a god. Many designs were plotted on his life; at length his mistress, Marcia, gave him poison and then had him strangled by a celebrated athlete in 192.

Common, RIGHT OF, is the right of taking a profit in the land of another in common with others. It may either be such a right as is enjoyed in common with others to the exclusion of the owner of the land, or it may not exclude the owner of the land. The commoner has no interest in the soil of the land on which he has a right of common. The profits, which may be the subjects of common right, are the natural produce of land (or water, which is included in the legal significations of land), such as grass and herbage, turf, wood, and fish. The commons relating to these subjects are accordingly called common of pasture, turbary, estovers, and piscarry. Other things which cannot be called products of land, but rather part of the land itself, as stones and minerals, may also be the subjects of common right. Rights of way and other accommodations in the land of another, though they may be enjoyed in common by several persons, do not bear that name, but are called easements. Common appendant is a right of common which a man enjoys in respect of his title to a piece of land. The right is appendant or attached to the land. Common claimed by prescription (which supposes a grant) may be as various as grants may be. A right of common thus founded may be either annexed to land (when it is said to be appurtenant), or altogether independent of any property in land (when it is said to be in gross). Common in gross must be claimed either by prescription or by deed, and is not appendant or appurtenant to any certain land. Common appurtenant may be severed from the land to which it was originally annexed, and then it becomes common in gross. The title to common by custom is peculiar to copyholders, and may also give the commoner various modifications of right. The rights of the owner of the soil over which a right of common exists are all such rights as flow from ownership, and are not inconsistent with the commoner's rights. Rights of common are conveyed like all other incorporeal hereditaments by deed of grant. When they are annexed to land they will pass with the land by any conveyance which is adapted to transfer the land. If the owner of common appurtenant purchase any part of the land over which the right extends, the right of common is altogether extinguished; it is the same if he releases his right over any part of the land. This unreasonable rule, however, does not extend to common appendant, though that will be extinguished if the commoner becomes the owner of all the land in which he has common, and partial extinguishment of the common will follow from acquisition of part of the land. The enfranchisement of a copyhold to which a right of common is annexed extinguishes the right. The Prescription Act (2 & 3 Will. 4, c. 71) applies to all varieties of rights of common, for the acquisition of which it enacts that after thirty years' enjoyment a right of common cannot be defeated by merely showing it commenced within time of memory, and, after sixty years' enjoyment, the right shall be absolute and indefeasible, unless it appear that the same was taken and enjoyed under some deed or writing. The remedies for disturbance of a right of common are the same as for the denial or obstruction of an easement.

Inclosure of Commons. The inclosure of commons is regulated by the Inclosure Acts, and these Acts contain many provisions for the protection of commoners and the formation of recreation

grounds, and "field gardens;" and the "Commons Act, 1876," not only amplifies such provisions, but lays down various new regulations to prevent "inclosure in severalty" as opposed to "regulation of commons" being made, unless it be proved to the satisfaction of the Inclosure Commissioners and of Parliament that the inclosure will be of benefit to the neighbourhood as well as to private interests, and to those who are legally interested in commons.

Common Law. The law of England or the rule of civil conduct prescribed to its inhabitants consists of two principal divisions, viz. the *lex non scripta*, the unwritten or common law, and the *lex scripta*, the written or statute law. It must not be understood, however, that the unwritten or common law is at present merely "oral," or communicated to us from former ages to the present solely by word of mouth. It is true, indeed, that in the profound ignorance of letters which formerly overspread the whole western world, all laws were entirely traditional, for this plain reason, that the nations among which they prevailed had but little idea of writing. Thus, the British as well as the Gallic Druids committed all their laws as well as learning to memory, and it is said of the primitive Saxons here as well as their brethren on the Continent that *leges solâ memoriâ et usu retinebant*. But with us at present the monuments and evidences of our legal customs are contained in the records of the several courts, in books of reports and judicial decisions, and in the treatises of learned sages of the profession, preserved and handed down to us from times of great antiquity. And these parts of our law are termed *leges non scriptæ*, because their original institution and authority are not set down in writing as Acts of Parliament are, but they receive their binding power and the force of law by long and immemorial usage, and by their universal reception throughout the kingdom. Our unwritten or common law is distinguishable into: (1) *General Customs*, which are the universal rule of the whole kingdom; (2) *Particular Customs*, which affect only the inhabitants of particular districts.

1. As to *General Customs*, or the common law properly so called, this is that law by which proceedings and determinations in the courts of justice are principally guided and directed; this for the most part settles the course in which lands descend by inheritance, the manner and form of acquiring and transferring property, the solemnities and obligations of contracts, the rules of expounding wills, deeds and Acts of Parliament, the respective remedies for civil injuries, and an infinite number of minuter particulars, which diffuse themselves as extensively as the ordinary distribution of common justice requires. Thus, for example, that the elder son alone is heir to his ancestor; that a deed is of no validity unless sealed and delivered; that wills shall be construed more favourably, and deeds more strictly. These and many others which might be instanced are doctrines that are not set down in any written statute or ordinance, but depend merely upon immemorial usage, that is upon common law, for their support.

2. *Particular* or *Special Customs* affecting only the inhabitants of particular districts; a custom of this kind it is usual to designate by the word "custom" simply, which sufficiently distinguishes it from the general customs above-mentioned.

These particular customs are mostly the remains of local customs prevailing in different parts of the country while it was broken into distinct kingdoms, and before the common law was collected and made applicable to the realm at large. Such, for instance, is the custom of Gavelkind in Kent, and some other parts of the kingdom; also Borough English, and many others, particularly the customs within the City of London as regards trade, apprentices, widows, orphans, and a variety of other matters. All these are more or less contrary to the general law, and are good only by special usage, though in many cases the customs have been confirmed or preserved by Act of Parliament. [Borough English, Gavelkind.]

Commune, in France, the smallest administrative unit, corresponding very roughly to our civil parish, governed by a *maire* and popularly elected council. After the war of 1870–71 a number of Parisian radicals endeavoured to make Paris a single commune—*i.e.* to obtain popular municipal government. Most of them, however, wished France to be a mere federation of communes, and many held more or less socialistic views. The movement was finally suppressed by the Provisional Government (then located at Versailles) on May 28, 1871, after ten weeks' bloody civil warfare. [France.] This movement should not be confused with communism proper.

Communism. [Socialism.]

Commutator, in *Electrical Engineering*, an important adjunct in direct-current dynamos, to cause all the electric currents which are generated in the revolving armature to travel in one direction in the external circuit. Without the use of the commutator alternating currents are produced, *i.e.* an oscillatory condition of the electricity is set up in the circuit without any ultimate passage of the electricity across any section of the conductor. [Dynamo, Electricity.]

Comnenus, a family which furnished six emperors to the Byzantine throne, from 1057 to 1185, viz. Isaac I., Alexis I., John II., Manuel I., Alexis II., and Andronicus I. After the Crusaders had overthrown the power of the Comneni in Byzantium, they established themselves on the throne of Trebizond, and held the reins of government there until 1204. [Anna Comnena.] The last ruler of the house was David Comnenus, who, with his family, was executed in 1461 at Adrianople by command of Mohammed II.

Como, a city of Italy in Lombardy and capital of a province of the same name, is situated in a delightful valley at the southern extremity of Lake Como. It is surrounded by old walls, and was a place of importance in the time of Julius Cæsar, when it was named *Novum Comum*. The cathedral and the town-hall, both built of marble, date from

the 14th and 13th centuries respectively. Its manufactures embrace woollens, silks, cottons, and soap; and by its port an extensive trade with Swiss produce is carried on. During the 12th and 13th centuries it was a republic. It was the birthplace of the Plinys, elder and younger, and the physicist Volta. The province covers an area of 1,049 square miles, and produces silk and wine.

Como, LAKE OF, *Lago di Como* of the Italians and *Lacus Larius* of the ancients, a lake of Italy, is situated at the foot of the Pennine Alps. Into it flows the river Adda at the north, issuing at the south-east. Its length is 30 miles, greatest breadth $2\frac{1}{2}$ miles, and depth 1,929 feet. It is divided into two branches by the promontory of Bellagio, the smaller branch being named Lago di Lecco. It is celebrated for the beauty of the surrounding scenery, and many villas line its shores.

Comoro Isles, four volcanic islands in the Mozambique Channel between Madagascar and the continent of Africa. They are named Great Comoro, Johanna, Mohilla, and Mayotta, and cover an area of 1,050 square miles. They belong to France. The inhabitants are Mohammedans, and export cocoanut oil and tortoiseshell. At Dsandsi, the capital, is a French garrison.

Company (Lat. *cum* and *panis*), literally an assemblage of comrades or rather messmates. 1. In commerce a company generally denotes a combination of individuals who club their resources for trading purposes, but who do not take a personal share in the management, this being entrusted to a board of directors chosen from among them. In a partnership all the members have a share in the management unless they prefer to be sleeping partners. In former times every member of a company was liable to the extent of his fortune for the debts of the company; but this principle was found to act as a discouragement to the investment of capital, and in 1862 a Limited Liability Act was passed whereby each member of a company registered under the Act was liable for no more than the amount of his own shares. This Act, with subsequent modifications, is the basis of the majority of companies now formed, and many old companies and banks have placed themselves wholly or in part under its regulation and protection. The last few years have seen a great development of the Limited Liability principle. Some companies are quasi-public, that is, their shares are to be bought and sold in open market.

2. In a military sense, a division of an infantry battalion, corresponding with the troop in cavalry and the battery in artillery, and commanded by a captain. It is the administrative unit of the battalion which consists of eight fighting companies, of 120 men strong, and two depôt companies, and commanded by a captain, aided by a lieutenant and second-lieutenants, with a certain proportion of non-commissioned officers. The company is divided for drill purposes into two half-companies, each consisting of two sections, and has its own accounts and books, for the due keeping of which the captain is responsible to the battalion commanding officer. An English battalion seldom has its full complement. In most other European armies the company, while still remaining the administrative unit of the battalion, is much more numerous, consisting (in the German army, for instance) of 249 men, and the captain is mounted instead of, as with us, on foot.

Comparetti, DOMENICO, was born in 1835 at Rome. In 1859 professor of Greek at Pisa, he exchanged that appointment for a similar one in the Instituto di Studii Superiori at Florence. While here he began to publish various papers of a philological character in the learned journals. He is best known through his *Virgilio nel Medio Evo;* also *Researches Concerning the Book of Sindibad*, published by the Folklore Society in 1882.

Compass. The mariner's compass, an instrument used to point out the course of a ship at sea, consists of three parts, the box, the fly or card, and the needle. The box, which contains the fly and needle, is a circular open brass case, so hung or floated, or otherwise supported, that it retains approximately the same horizontal position in all motions of the ship. The fly is a circular disc, generally of paper, representing the horizon, and divided into thirty-two equal parts by lines radiating from the centre and called rhumbs or "points." The intervals are subdivided into halves and quarters, and the entire circumference is also divided into 360 parts or "degrees." The angle between "point" and "point" equals, therefore, $11\frac{1}{4}$ degrees. The four chief or cardinal points are north, east, south, and west, and the thirty-two in their order, beginning from north and moving round to the right, are thus known:—

N	E	S	W
N by E	E by S	S by W	W by N
N N E	E S E	S S W	W N W
N E by N	S E by E	S W by S	N W by W
N E	S E	S W	N W
N E by E	S E by S	S W by W	N W by N
E N E	S S E	W S W	N N W
E by N	S by E	W by S	N by W

The origin of the mariner's compass is lost in the mists of antiquity, and nothing certain is known of it. F. Gioja, at the beginning of the 14th century, seems to have been the first to devise some such a form of it as has been described above. The magnetic needle's variation or declination (q.v.) from the true north was discovered by Sebastian Cabot in 1497, and its inclination or dipping when it is so hung as to play vertically to a point beneath the horizon, was first remarked by Robert Norman in 1576. The different variations or declinations at various times in the same locality were originally noticed by Gillibrand in 1634, though the observation has been claimed for Gassendi. To "box" the compass is to repeat the points of the compass in their proper order.

Many modifications of the compass have been introduced, and the one now in almost universal use is the invention of Sir William Thomson. A number of strips of steel are magnetised

separately and are then either bound together or else fixed parallel to each other on a small and light framework. This compound needle is delicately pivoted at its centre, a sharp point of steel or iridium supporting a small inverted cup of agate or sapphire that is fixed to the needle. The circular card is fixed horizontally to the upper part of the needle. The compass is held in a bowl which is weighted below with castor oil, and is so supported in the bowl and the outer box as to remain horizontal when the compass-box is tilted. The presence of masses of iron or steel or of electric circuits in the neighbourhood of the needle will cause its deviation from the magnetic meridian. It is necessary to compensate for these effects by the arrangement of suitable bars of iron or magnetised steel to neutralise such external influences.

Compasses are very useful instruments for drawing circles, marking off distances, or for other similar purposes in geometrical and mechanical drawing, architectural drawing, and workshop practice. Essentially, they consist of two points that can be kept at the same distance apart. The ordinary compass satisfies this condition by having two equal arms of brass, German-silver, or other suitable metal pivoted together at one end and pointed at the other. There is generally an arrangement for replacing one of the metal points by a pencil or pen, so that curves, etc., may be drawn in pencil or in ink as required. *Beam-compasses* admit of much greater distances between the points; the two pointers are separate, and slide along a batten or lath of hard wood. There are numerous other varieties of such instruments, designed for special geometrical purposes.

Compensation. 1. In general *Physics*, a term employed to denote the elimination of certain undesired effects by the introduction of opposite ones. Thus, the pendulum of a clock is required to remain of constant length; but in warm weather heat expands the pendulum, and the clock is on this account made slower. But the pendulum may be compensated by being made to support at its lower end a cylinder of mercury instead of the ordinary solid pendulum-bob. When heated in warm weather the mercury expands upwards, and so, if properly adjusted, it neutralises the downward expansion of the pendulum-rod, and renders the swing isochronous in all weathers.

2. In English law compensation denotes (1) the pecuniary sum awarded under railway and other statutes, in payment and compensation of and for lands and buildings taken compulsorily or by agreement for public purposes. The chief statute upon the matter is the "Lands Clauses Consolidation Act, 1845" (8 and 9 Victoria, c. 18). and the "Agricultural Holdings Act, 1875," provides for the payment of compensation to agricultural tenants for improvements executed by them. (2) In agreements between vendors and purchasers of real estate it is usual to stipulate that errors, misdescriptions, and omissions in description of the property shall not avoid the sale, but be the subject of compensation. But such a stipulation will not protect the vendor in case of misdescription arising from fraud or gross negligence, or of such a nature that in the absence of it the purchaser would presumably not have entered into the contract at all.

Compiègne, a town of France in the department of Oise, is situated on the river Oise. It is chiefly celebrated for its palace, rebuilt by Louis XV., and near the forest of Compiègne, which covers 30,000 acres. Its chief edifices are the church of the ancient abbey of St. Corneille, where were interred the remains of many of the early kings of France, and the Hôtel de Ville, a Gothic structure. The inhabitants manufacture muslins, hosiery, and cordage, and do a trade in grain and timber.

Complement of an angle, in *Geometry*, is that angle which must be added to the first to make up 90°. Thus the complement of 15° is 75°, and of 100° is −10°. So, also, in *Astronomy* the complement of the altitude of a heavenly body is its zenith-distance. In *Arithmetic*, two numbers are complementary, which, when added together, give the next higher power of ten than the greater of the two numbers. Thus, $65\frac{1}{2}$ and $34\frac{1}{2}$ are complementary, their sum being 100. In *Music*, complementary intervals are those which make up an octave. In *Optics* (q.v.), complementary colours are those which combine to form white light, such as red and green.

Compositæ, the largest natural order of flowering plants, comprising some 10,000 species in about 1,000 genera, or one-tenth of all known flowering plants. equally divided between the Old and the New World. They are herbs, or sometimes shrubs, with exstipulate leaves, and small flowers crowded into a *capitulum* or head (once called a compound flower). surrounded by an involucre of bracts. These florets may be of two kinds, the outer or *ray* having ligulate corollas, whilst the central ones or *disk* are tubular. They may also differ in sex. There are five sepals, though seldom with a recognisable limb, five united petals, five stamens, which are very characteristic in being epipetalous and syngenesious, and two carpels united into a one-chambered, one-ovuled inferior ovary with a bifurcate style. The order falls into three suborders:—*Liguliflorœ* or *Cichoriaceœ*, with florets all ligulate, and a milky latex, including the chicory, endive, lettuce, salsafy, dandelion, etc.; the *Tubuliflorœ*, with all the florets tubular, as in the thistles, or with the outer only ligulate, as in asters, daisies, sunflowers, etc.; and the *Labiatiflorœ*, with bilabiate florets, a small group mainly South American. Besides many other showy plants, such as *Dahlia*, *Chrysanthemum*, *Cineraria*, etc., the order contains many aromatic, bitter, and tonic plants, such as the wormwoods (*Artemisia*), and some that are acrid and poisonous, such as *Arnica*.

Composition, in *Dynamics* or more generally in vector calculus, means the addition of two or more quantities that possess direction and sense as well as magnitude; such as a number of velocities, forces, or rotations. The sum obtained by the process is called the *resultant;* the constituents

of this resultant are called its *components*. [Polygon of Forces, Vector Addition.]

Composition with Creditors, an alternative course of proceeding by any one in insolvent circumstances to that of bankruptcy, which has always been of extensive use, being in many respects more convenient, and not entailing the publicity of bankruptcy. The general principles of the law of bankruptcy, however, apply to a composition, though in some of its details it differs from the course devised for a bankruptcy, and it is expressly provided by the existing "Bankruptcy Act, 1883," that the trustee (if any), under *a composition or scheme of arrangement* under that Act, shall have the same powers and perform the same duties as a trustee under a bankruptcy, and that the property of the debtor shall be distributed in the same manner as in bankruptcy, and generally that all the provisions of that Act with reference to bankruptcy shall also apply (*mutatis mutandis*) to such a composition or deed of arrangement. The true spirit of the bankruptcy laws has always been to provide the easiest way of carrying out amicable arrangements between a man and his creditors freed from external interference, so far as the prevention of fraud and commercial morality would permit. Two methods of proceeding have consequently been authorised by the Legislature for this purpose; these are by composition or scheme of arrangement either before or after adjudication.

Compound, Chemical. [Atomic Theory.]

Compound Interest. [Interest.]

Compound Magnets. When a solid piece of steel is magnetised we find that the external surface is much more intensely affected by the magnetising influence than the interior, and it is difficult to render the whole mass uniformly magnetised. If, therefore, a powerful magnet is to be manufactured, it is usual to build it up of thin strips or rods of separately-magnetised steel, the whole bundle being then bound together or the pieces fixed parallel to each other on a suitable framework. Such an arrangement is called a compound magnet; it is stronger than the simple magnet, and retains its magnetism more permanently.

Compound Pendulum. A simple pendulum is understood theoretically to mean an infinitely small mass suspended from a point by a thread without mass. Such an arrangement cannot exist, and can only be approximated. Any distribution of mass oscillating about a point from which it is suspended forms a compound pendulum. Its period of oscillation is equal to that of a simple pendulum of determinate length; this is called the *equivalent* simple pendulum. In every compound pendulum there exist pairs of points, either of which may be made the centres of suspension without changing the rate of swinging. [Pendulum.]

Compound Proportion. [Proportion.]

Compounding Felony or Theft. Where any one has been robbed and he knows the felon, and receives back from him his goods that were stolen, or some other amends, upon agreement not to prosecute, this is a misdemeanor. Under a statute of the present reign, known as the "Larceny Act" (24 and 25 Victoria, c. 96), whosoever shall publicly advertise a reward for the return of any property whatsoever which shall have been lost or stolen, suggesting that no questions will be asked, or offering to repay to any pawnbroker or other person the amount advanced on the security of the property, forfeits the sum of £50 for every such offence, to be recovered by any informant thereof. And the printer and publisher are also liable, but in their case the action is to be commenced within six months, and only after obtaining the sanction of the Attorney- or Solicitor-General to the institution of the prosecution.

Compressed Air Engine. A type of motor much used for certain special kinds of work, in which the motive power is supplied by high-pressure air. The engine is pretty much the same in principle as the steam-engine, compressed air supplying the place of high-pressure steam. This air is compressed by suitable pumping machinery, which may be at some distance from the air-engine. Such an arrangement is convenient in boring, tunnelling, or similar work, where it is difficult to introduce steam or other motors, and where the pressure energy required may readily be conducted to the scene of operations by air-pipes from the distant pumps. [Pneumatics.]

Compressibility. That property of matter by which it may be diminished in volume when subjected to pressure. All substances, solid, liquid, and gaseous, are to some extent compressible. Gases submit to diminution in volume readily, the intensity of pressure required to effect this being inversely proportional to the volume. Thus, if the gas be compressed to half its bulk, the new pressure which it exerts, and which must therefore be exerted on it, will be double the former pressure. This is known as Boyle's Law (q.v.). Liquids and solids, on the other hand, offer very great resistance to change of volume, though the former are changed in shape under the action of slight distorting forces. The famous Florentine experiment, in which a hollow sphere of gold, filled with water, allowed so little compression that the water oozed through the gold shell when subjected to great pressure, was regarded for some time as a proof of the non-compressibility of water. Nevertheless an instrument called the *piezometer* demonstrates and measures the diminution in volume of water or other liquids under pressure. Water diminishes $\frac{1}{20000}$th of its volume under a pressure of one ton per square inch. It must be understood, however, that, under special circumstances, the liquid condition of matter may merge imperceptibly into the gaseous. Towards this critical condition of temperature and pressure it is found that the liquid suffers much change in volume for slight changes in pressure. The compressibility of solids, as a rule, is less even than that of liquids. The compression of ice at 0° C. will convert it to water [Regelation], and the compression of steam at boiling-point will convert it to water, for pressure

lowers the freezing-point and raises the boiling-point of that liquid.

Comte, Isidore Auguste Marie François Xavier, founder of Positivism, born 1798, came of a Catholic family. He was educated at the École Polytechnique in Paris, whence he was expelled in 1817 for heading a complaint against one of the tutors. Shortly afterwards he settled in Paris, earning his living by mathematical teaching. In 1818 he met with St. Simon (q.v.), whose theories he adopted, and whose pupil he became until 1824, when an estrangement took place. In 1825 Comte married, but the union was an unhappy one. A course of lectures on his philosophy, begun in 1826, was interrupted by an attack of insanity which lasted into 1827. His *Cours de Philosophie Positive* was published in six volumes from 1830–1842, when he held a position in the École Polytechnique. In 1845 he formed an intimacy with Clothilde de Vane, who seems to have influenced him to a great extent. Comte died in 1857. For an account of his philosophy *see* Positivism.

Comus, in the later period of Greek mythology, was the god of mirth, revelry, and feasting. He was represented as a drunken youth. The name is Greek, signifying revel or a company of revellers.

Comyn, otherwise Cumming or Cumyn, a family that took its name from Comines, a town on the French and Belgian frontier. Its connection with England began with the Conqueror, who in 1069 sent Robert Comyn, afterwards Earl of Northumberland, to bring under his sway the northern provinces. A descendant, John Comyn (Black Comyn), Lord of Badenoch, unsuccessfully competed in 1291 for the Scottish crown. His claim was based on his descent from Donald Bane through the marriage of an ancestor with Hextilda, the Scottish king's granddaughter. His son, John Comyn (the Red Comyn), was one of the three wardens of Scotland, and distinguished himself in the wars with the English, whom in 1302 he defeated at Roslin. In 1304, however, he submitted to Edward I., and, falling under the suspicions of Bruce, was stabbed by the latter, in 1306, before the altar of the Franciscans at Dumfries. To such power did this family at one time attain that in Scotland in the 13th century among its members were four earls, one lord, and thirty-two belted knights.

Concealment, or "*suppressio veri*," is where a party to a contract does not disclose some fact relating to it to the injury or prejudice of another. In order to amount to a fraud, it must be the suppression or non - disclosure of facts which one is bound to disclose to another, either legally or equitably, the latter being entitled to the possession of such facts. An important distinction occurs between representations which are intrinsic, forming the very essence of a contract, and those which are extrinsic, forming no part of it, although offering inducements to enter into it, or affecting the value of the property contracted for. As to the former, the caution "caveat emptor" applies, unless there be some artifice to disguise the subject of the contract or some warranty as to its quality; a purchaser is bound by the sale, although there may exist extrinsic defects in it known only to the vendor which greatly affect its worth. [Caveat Emptor.]

Concealment of Birth. Endeavouring to conceal the birth of a child by any secret disposition of its dead body is a misdemeanor punishable by two years' imprisonment with hard labour.

Concepcion. 1. A seaport of Chili, and capital of a province of the same name, is situated near the mouth of the Biobio river. It is a well-built town with a cathedral, and its port Talcahuano, $7\frac{1}{2}$ miles away on Concepcion Bay, is one of the safest and most commodious in Chili. The province of Concepcion covers an area of 3,535 square miles, and has fertile plains and rich coal mines. 2. The name given to two towns in Bolivia, one in the department of Tarija, in a wine-producing district, the other in the department of Santa Cruz, where there are mines; also to a town in Mexico, and another in San Domingo. 3. A town of Paraguay, and capital of the district of the same name, is situated on the Paraguay river.

Concepcion del Uruguay, formerly the capital of the province of Entre Rios in the Argentine, is situated on the river Uruguay. Its chief industry is in slaughtering.

Concertina, a musical instrument resembling the accordion, invented in 1829 by Sir Charles Wheatstone.

Conchifera. [Lamellibranchiata.]

Conchoid, a curve invented by Nicomedes, by which any angle may be trisected.

Conchology (Gk. *conchè*, shell), the science of shells, sometimes used as synonymous with the scientific study of molluscs, which were formerly classified according to the formation of their shells. Later science, however, studies them from the point of view of their internal characteristics, and the word conchology is now applied rather to the study and collection of shells simply, without regard to their occupants.

Concierge (from Lat. *conservare*, preserve or guard) is a French word signifying the porter and guardian of a house let off in different apartments or flats.

Concord. 1. A town of the United States, in Middlesex county, Massachusetts, is situated on the Concord river, about twenty miles north-west of Boston. It has a large flannel manufactory, and was the residence of Emerson, Thoreau, and Hawthorne. It was the scene of a skirmish between the British and a small body of militia on April 19, 1775, when the first blood of the revolution was drawn. 2. The capital of the state of New Hampshire, is situated on the Merrimac river, along whose front it extends for two miles. It has extensive granite quarries and various manufactures in textiles and machinery.

Concordance, a kind of index—generally verbal—to a book or a writer. The word came into especial use with reference to the Biblical

Concordance, published in 1737 by Cruden. This was not an original idea, since there already existed a Concordance to the Vulgate. In 1845 Mrs. Cowden Clarke published a Shakspeare Concordance, and since then the principle has been applied to the works of many poets, and to the body of English poetry—or, at least, to the works of the best-known poets.

Concordat (Lat. *concordatum*, a thing agreed upon) may mean any kind of convention or *modus vivendi*, but is more commonly used to signify the compact, made in countries where Catholicism is the prevailing religion, between the Pope and the civil authorities, and having for its object the securing of their respective rights. Theologians have differed as to the exact nature and the binding force of the concordat. The most notable concordat is perhaps that concluded in 1801 between Pius VII. and Napoleon, then First Consul.

Concordia, a town of the Argentine republic, in the province of Entre Rios, is situated on the Uruguay river. It is connected by a railway 97 miles long with Monte Caseros.

Concrete, a composition consisting of some cement as mortar, hydraulic mortar, asphalt, etc., mixed pebble, broken bricks, etc. It sets forming a hard, durable mass, and is largely used for formation of pavements, the foundations of houses, for structures below water, and sometimes even for walls of houses. In the latter case it is filled in between boards, and when set the boards are removed.

Concretion. For urinary and biliary concretions *see* CALCULUS. Intestinal concretions are not uncommon in some of the lower animals.

Concretions, more or less isolated masses, spherical, elliptical, or irregularly nodular in form, occurring commonly in layers in stratified rocks, varying in size from minute particles up to masses several feet in diameter, and generally differing in composition from the rock in which they are imbedded. Thus. in alluvial clays and gravels we find fantastically irregular nodules of calcareous matter known as "race," "fairy-stones," or, on the Rhine, "löss-puppen"; in the Lias, Oxford, London and other clays we have the large "septaria" (q.v.) of impure limestone; in clays or in Chalk we have nodules of iron pyrites; and in the latter the well-known flints, resembling the siliceous phthanites and cherts occurring in other limestones. Concretions have been formed subsequently to the deposition of the rock in which they are, the lines of stratification often passing through them. They are often formed round a fossil as a nucleus, or have caught up one or more in the process of their formation, these fossils not being necessarily at all similar in composition to the nodule. That they have been produced by chemical aggregation is evidenced by the presence of less silica diffused as an impurity through chalk in the vicinity of lines of flint nodules than farther from them. The general law of their formation would seem to be that any chemical substance, existing in a small proportion diffused through the mass of a rock, is likely to be drawn together in lumps, especially round any solid body. Some rocks exhibit a concretionary structure throughout, as in the beds of clay-ironstone nodules in the Coal-measures, in oolite (q.v.), and in pisolite; and in other cases a flaking off of concentric shells is only manifested on the decay of the rock when exposed.

Concubine (Lat. *concumbo*) signifies literally a bed-fellow, and specifically, a woman whose connection with a man, though of a somewhat permanent nature, is less binding than the tie of marriage. The Roman law admitted other kinds and degrees of marriage than the full and formal *confarreatio;* and though the Christian Church set its face against irregular sexual connections, it was long before the practice of concubinage was generally put down. Students of Church history will remember the tenacity with which in some countries the priesthood clung to the practice, which lingered also among the laity in England as the custom of hand-fasting. Concubinage has fallen into disrepute in England, but is looked upon leniently in many Continental countries.

Concussion of the Brain. The symptoms of brain injury have been referred by surgeons into two groups. The term concussion of the brain is applied, roughly speaking, to those cases in which a head injury produces insensibility unaccompanied by any actual paralysis; while if, on the other hand, paralysis is developed, the condition is said to be one of compression of the brain. In thus drawing a hard and fast line between two classes of symptoms, the origin of the terms concussion and compression is practically ignored. When the word concussion was first employed by surgeons it was intended to be applied to those cases where, as the result of injury, the brain was shaken, but not affected by any gross lesion. While to other cases, where the injury produced rupture of blood-vessels within the cranium, with effusion of blood, and resulting pressure upon the brain, the term compression was applied. Inasmuch, however, as the sudden increase of pressure within the skull, produced by the rupture of a blood-vessel, is frequently productive of some form of paralysis, the existence of paralysis came to be associated with compression, and its absence with concussion. The symptoms of concussion are those of shock (q.v.). The patient is unconscious, with pale face, cold skin, feeble and often irregular pulse, and shallow and feeble attempts at respiration. This first stage or stage of collapse, as it is called, may terminate fatally, or may be rapidly followed by recovery, but it usually passes into what is termed the stage of reaction. In this last event consciousness returns, and some febrile movement is set up, which is either after lasting a few days followed by convalescence, or, in unfavourable cases, passes into an inflammatory stage. Treatment of the initial symptoms of concussion consists in placing the patient in bed, keeping him warm, and as quiet as possible. Stimulants should be avoided. Medical advice must, of course, be at once obtained, as a head injury severe enough to

produce unconsciousness is no trifling matter. Concussion of the spinal cord is a disease which has sprung into notoriety of quite recent years in connection with railway accidents. The difficulty of arriving at a clear apprehension of the nature of the symptoms produced in such cases has been much enhanced by the fact that the matter has been complicated by questions of compensation, and concussion of the cord has figured largely in medico-legal literature.

Condé, Louis de Bourbon, Prince of, founder of the house of Condé, was the younger brother of Anthony, King of Navarre, and was born in 1530. Though deformed, he was yet extremely brave, and adopted a military career. After distinguishing himself in the wars between Henry II. and Charles V., he joined the Huguenots, who were struggling for state recognition, and was implicated in the conspiracy of Amboise of 1560, which aimed at the subversion of the power of the Guises. On the failure of the plot Condé escaped execution only through the death of the king, and the assumption of the regency by Catherine de' Medici. The massacre of 200 Huguenots in 1562, at Vassy, by Duke Francis of Guise, led to the first civil war, Condé and Coligny enrolling an army of Huguenots. Defeated and taken prisoner at Dreux, Condé was liberated under the pacification of Amboise in 1563. In 1567, however, the concessions granted by the pacification were revoked, and the second Huguenot war broke out. At the battle of Jarnac in 1569 Condé again suffered defeat, and on yielding his sword to the enemy, a Catholic officer, Baron de Montesquieu, treacherously shot him.

Condé, Louis de Bourbon, Prince of, known during the lifetime of his father, Duc d'Enghien, as "the Great Condé," was born in 1621. In 1641 he was compelled to marry Claire Clémence de Maillé Brézé, a niece of Cardinal Richelieu. In 1643 he was appointed to the chief command of the French forces, and at Rocroi inflicted a severe defeat upon the Spanish army. Again in 1644 he was sent into Germany to the relief of Turenne, and met with his usual success, defeating the Comte de Mercy at Nordlingen, and in 1646 capturing Dunkirk. During the troubles of the Fronde he espoused at first the side of the court, and ultimately, at a conference between Mazarin and Molé at Ruel, peace was arranged. Condé now sought to assume almost regal power, and with Conti and Longueville was imprisoned in 1650 by Mazarin. Popular feeling, however, grew so strong in favour of the prisoners that they had to be liberated, and Condé at once put himself at the head of another Fronde and sought assistance from Spain. The war that now began was decided at the battle of the Dunes, near Dunkirk, when Turenne, with the aid of 6,000 of Cromwell's Ironsides, defeated Condé, and the peace of the Pyrenees, 1559, was entered into, whereby Louis restored Condé to his rank in France. His further achievements embraced the reduction of Franche-Comté in 1668, the defeat of the Prince of Orange in 1673 at Senef, and his successful generalship of the army of the Rhine, in which he overcame Montecuculi. Henceforth, worn out by the excesses of his life, he retired to Chantilly, where he spent the remaining eleven years of his life, and died in 1686.

Condenser. In *Chemistry*, a piece of apparatus employed for the purpose of condensing to the liquid state the volatile vapours evolved in distillation (q.v.). The most common and generally useful form is that known as Liebig's condenser, consisting of an inner glass tube surrounded by a larger outer tube, with a current of cold water kept flowing between the two. If very volatile liquids are being distilled it is frequently necessary to pass the gases through a spiral tube or "worm" surrounded by ice-cooled water or a mixture of ice and salt. Various complicated forms of condensers are sometimes employed, which serve also to partially separate the more volatile from the less volatile products of distillation. In the *steam engine* it is an arrangement for converting the exhaust steam into water, so as to diminish the back pressure in the cylinder to a much lower intensity than that of the atmosphere. Engines that do not employ such an arrangement are termed *non-condensing* engines, of which locomotives afford an illustration. Economy of space and weight may forbid their use, though with them the engines are more efficient. Condensers are of two types:—*Jet* condensers employ a jet or spray of water falling into a suitable chamber. The exhaust steam enters from the cylinder, and is at once condensed. It warms the water, but cannot return at any high temperature to the boiler again. *Surface* condensers consist of a series of communicating metal tubes into which the steam passes; the tubes are kept cold by water flowing round them on the outside. The condensed steam in this way does not mix with the condensing water, and may be pumped back into the boiler at a high temperature. This arrangement utilises a certain amount of heat, the same water is used continually, and very little sediment is deposited in the boiler. [Steam-Engine.] In *Electrical Engineering* it is an arrangement of two conductors separated by a non-conductor or *dielectric*. Thus a Leyden jar, consisting of a glass vessel coated inside and outside with tinfoil, or a submarine cable formed of a conducting wire insulated from the surrounding water by a guttapercha coating, affords an example of condenser. So also a thunder-cloud and the earth, with the non-conducting air between them, form a condenser. If a quantity of positive electricity be introduced on to one of the conductors, an equal quantity of negative electricity will be induced on the nearer side of the other conductor. If the two conductors are close together, the tendency for these opposite electricities to combine is almost permitted, and there is not much potential energy in the system; if the conductors are far apart and if they possess the same quantities of electricity as before, work has been done to separate them and the system is at a higher potential. So, in the former case, it will require a larger amount of electricity on the conductors to bring the potential energy up to the standard *volt* (q.v.). This amount of electricity is called the *capacity* of the condenser; it is measured

theoretically in *farads*, commercially in millionths of a farad, or *microfarads*. If the dielectric is not sufficiently thick or strong, the tendency of the two electricities to combine will be great enough to break the dielectric—as for example in the lightning-flash which exhibits the disruption of the air-space between the cloud and the earth. Practically, the capacities of condensers are increased by making them of several pairs of plates instead of a single pair. The dielectric is chosen of paraffined paper or mica, to effect the same result. Their use in practice is very extended. [ELECTRICITY, CAPACITY.]

Condillac, ETIENNE BONNOT DE MABLY DE, philosopher, was born in 1715 at Grenoble. He was instructor to the Duke of Parma, Louis XIV.'s grandson, and for him many of his treatises were written. In his *Essai sur l'Origine des Connaissances Humaines* he contends against the doctrine of innate ideas, and in the *Traité des Systèmes* he supports the theory that knowledge is based on experience. Other of his works are *Traité des Sensations*, *Traité des Animaux*, and *Le Commeree et le Gouvernement*, which appeared in 1776, the same year as Adam Smith's *Wealth of Nations*. Condillac, too, was a free trader, and he treats political economy as the science of exchanges. In 1768 he was elected to the Academy, and in 1780 he died on his estate at Flux, near Beaugency.

Condiments (Lat. *condire*, to pickle) are those articles of food, or rather those accompaniments of food, which are used to impart a relish or as incentives to appetite, rather than for any nutritive value that they may possess. Among these, the best known are salt, pepper, mustard, vinegar, and piquant sauces.

Condition is a restraint annexed to anything, so that by its non-performance the party to it shall receive prejudice and loss, and by its performance commodity or advantage, or it is that which is referred to as of uncertain chance, which may or may not happen. There are several kinds of conditions, as

1. *A Condition in a Deed*, which is *express*, as if a person make a lease of property to another, at a certain rent and under certain covenants, upon condition that if the lessee fail in payment at the day or in preference of his other covenants, then the lessor may re-enter.

2. *A Condition in Law* is implied as when one grants to another an office as keeper of a park, steward, bailiff, etc., for a term of life. Here, though no condition be expressed in the grant, yet the law implies that the grantee shall faithfully execute all things belonging to the office, otherwise the grantor may discharge him.

3. *A Condition Precedent* is where an estate is granted to one for life on condition that if the grantee pay to the grantor a certain sum of money on a particular day, he shall have the fee simple. In this case the condition precedes the estate in fee which does not vest in the grantee till performance thereof.

4. *A Condition Subsequent* is where one grants to another an estate in fee upon condition that the grantee shall pay him on such a day a certain sum, or that his estate shall cease. Here the condition is subsequent and follows the estate, and upon the performance thereof continues and preserves the same, so that a condition precedent gains the thing made upon condition by the performance of it, whereas a condition subsequent keeps and continues it by the performance of the condition.

Conditions are likewise *affirmative*, which consists of doing an act; *negative*, which consists of not doing an act; *restrictive*, for not doing a thing; *compulsory*, as that the lessee shall pay rent, etc.; *single*, to do one thing only; *copulative*, to do divers things; and *disjunctive*, where one thing of several is required to be done.

Conditional Immortality, an idea which is the creation of certain religious sects, which hold that man's life generally is like that of other animals, but that those who have faith in Christ are privileged to live on still in a future existence. It is a theory resting on no scientific basis, but founded in part upon certain interpretations of passages of Scripture, and naturally incapable of either proof or disproof.

Conditions of Sale. When a freehold, copyhold, or leasehold property is offered for sale by auction, "Conditions of Sale" (indicating the nature and extent of the vendor's title, the terms of the sale as to completion, etc.) are prepared by the vendor's solicitor, and usually taken "as read" at the auction. It behoves an intending purchaser *carefully to look at these* before attending the auction, and to be advised thereon by his solicitor, *particularly* in regard to the condition as to title. This is not very frequently done, although entailing a very small expense. Hence, an unsatisfactory title is often foisted upon him. The conditions are generally subject to modification in the auction room.

Condonation. [DIVORCE.]

Condor (*Sarcorhamphus gryphus*), the great vulture of the Andes, the largest species of the family. Before Humboldt's time the most extraordinary stories were told of the size and strength of this bird, and to that traveller is due the credit of recording measurements which brought down the estimated wing-spread of 15 feet to 8 ft. 6 in. or 9 feet, and gave the average length of an adult male as 42 inches; the female is somewhat less. The home of the Condor is in the Andes, and it ranges down the west coast as far as the Straits of Magellan, on the east to the mouth of the Rio Negro. The general hue of the plumage is black, the secondary feathers and most of the wing coverts are grey. There is a white downy ruff on the neck; above this the head and neck are bare; and the male has a large fleshy comb. These birds feed on carrion, which they discover by sight rather than by smell, and their flight is remarkably powerful. According to Darwin they make no nest, but lay two large white eggs on a shelf of bare rock. The king vulture (*S. papa*), the only other species of the genus, is a smaller and rarer

bird. The general plumage is fawn, and the head and neck are covered with orange, purple, and crimson caruncles. It is a native of the wooded parts of Central and South America, and derives its popular name from its tyrannising over the Turkey vultures (q.v.). [VULTURE.]

Condorcet, JEAN ANTOINE NICOLAS DE CARITAT, MARQUIS DE, was born in 1743 at Ribemont, in the French department of Aisne. Educated at the Jesuit College, Rheims, he thereafter studied mathematics with great success in Paris, at the College of Navarre. In 1765, through an essay on the "Integral Calculus," he was elected to the Academy. During the Revolution he used his pen on the side of the people, being appointed in 1791, by Paris, to the Legislative Assembly, of which, in 1792, he became president. He opposed the execution of the king, though willing that he should be punished, and in consequence fell under the suspicions of the extreme party, by whom he was condemned. Driven from place to place of concealment, he was at length arrested, and, on the 7th of April, 1794, thrown into prison of Bourg-la-Reine, where he was found dead on the following morning. By what means he met his death is not known. In his own day he was chiefly noted for his application of mathematical calculations to human conduct, and as to his philosophic views in general they were of the broadest and most advanced kind.

Condottieri, a word of Italian origin applied in the Middle Ages to the leaders of bands of Free Lances or Free Companions, which was the name given to those mercenaries who, trained to arms, and having no special ties of patriotism, traversed Europe always ready to sell their lives and swords to the highest bidders. They were the counterpart of the modern standing army minus the consideration of patriotism. Bulwer Lytton, in *Rienzi*, has given a good picture of them, and Scott, in the *Legend of Montrose*, describes a later edition of the same character in the person of Captain Dugald Dalgetty.

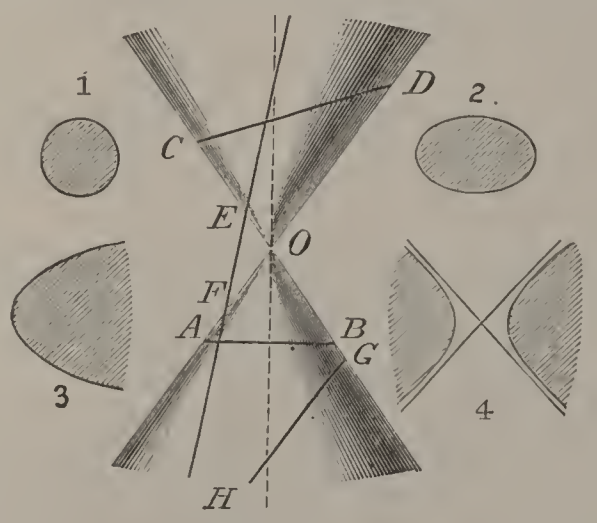
Conduction, in *Physics*, means the transfer of heat or electricity from one point to another at lower temperature or potential, by means of an intervening material medium whose particles do not alter their relative positions in effecting the transfer. Different materials have different powers of conduction. Metals are, as a rule, good conductors of both heat and electricity, silver and copper ranking first and second in their conductivity. The opposite quality of a material, to resist the passage of the current, is termed *resistance* (q.v.). It is possessed in a high degree by *insulators* (q.v.), though no perfect insulator exists. But much better insulation is possible for electricity than for heat. [HEAT, ELECTRICITY.]

Conductor (a leader) generally signifies the leader of the music in the opera or in concerts. Their practice of conducting music by the wielding of a bâton is of comparatively late introduction. The name is also applied to the person in charge of a public vehicle, whose duty it is to collect fares and to signify to the driver when to go on and when to stop. On some English railways a kind of superior guard upon certain important trains is sometimes called a conductor; and of late years Messrs. Cook have made us acquainted with personally-conducted travelling parties.

Condy's Fluid consists of a solution, in water, of potassium permanganate, $KMnO_4$. It is largely employed as a disinfectant and deodoriser.

Cone, the female flower of the majority of the Coniferæ (q.v.), consisting of a more or less elongated axis which often becomes woody, and bears, either in alternating whorls or more commonly in complex spirals, the sporophylls, cone-scales, bract-scales, or open carpels, as they are variously termed. In the juniper there are but three scales in a whorl which become fleshy and form the well-known berry. In other Cupressineæ there are alternating whorls of two, three, or four carpels bearing ovules, often many in number on a placental swelling in their axils. In many other conifers this placenta is replaced by a scale, or ligular appendage of the carpel, known as the seminiferous scale, bearing two ovules on its inner face. This seminiferous scale, as to the exact nature of which there has been much dispute, generally outstrips the carpellary scale in growth, and becomes woody. In pines (q.v.) it acquires a thickened woody extremity or *apophysis*, forming one of the diamond-shaped *tessellæ* on the surface of the unripe cone. In the firs (*Abies*) carpellary and seminiferous scales alike fall away from the axis when the seed is ripe; in the spruces (*Picea*) the cones fall whole; and in pines they persist on the tree, only opening to drop their seeds.

Cone is a surface, the general form of which is generated by a line moving so that it always passes through a given point and always cuts a given closed curve. If the closed curve be a circle and the given point be vertically above its centre, we



CONIC SECTIONS.

obtain the *right circular cone*. This may be regarded as the solid generated by a right-angled triangle revolving about one side. This side forms the *axis* of the cone, the slant edge of the triangle generates the curved surface, and the third side generates the circular base. It is by cutting this special solid in plane sections that we obtain the *conic sections*. The volume of a cone is obtained

by multiplying the area of its base by one-third of its vertical height. Its mass-centre is one quarter of the way up its axis. If a section be made of the cone at right angles to its axis, as across A B, a circle is obtained. If across from one side to the other, as C D, an ellipse is produced. If parallel to the slant edge of the cone, as G H, the curve of section is of infinite extent; this is the parabola. If the cut is made so as to include sections on both halves of the cone, as E F, we get the hyperbola, which evidently possesses two branches. If the cut passes through the apex O, we get a line pair or a point. All these sections are known as *conics*, and are much studied in mathematics by both geometrical and analytical methods. Generally, they are defined as the curves which mark the positions of those points in a plane, whose distances from a given point are proportional to their distances from a given straight line in the plane. In projective geometry (q.v.) totally different definitions may be introduced as the basis of their investigation.

Coney Island, situate at the entrance of New York harbour, and near the S.W. angle of Long Island, is five miles long and half a mile broad. It is a popular summer resort, and is the terminus of several railways connecting it with Brooklyn. Steamers also ply in the bathing season between it and New York, which is eleven miles distant.

Confederate States is the special name applied to the eleven of the United States of America — namely, North and South Carolina, Alabama, Florida, Mississippi, Georgia, Louisiana, Texas, Virginia, Arkansas, and Tennessee—which seceded from the Union in 1861 upon the question of slavery and the election of President Lincoln. They entered again into the Union at various dates after the end of the Civil war, under revised constitutions.

Confederation of the Rhine was the union of sixteen German princes in 1806, who, in alliance with France and under the protection of Napoleon I., forsook the general body of German interests. This somewhat unpatriotic combination existed till 1813, when the reverses of Napoleon gave it its death-blow, and gave rise to a healthier desire for German unity.

Conferva, the typical genus of the *Conferroideæ Isogamæ*, named from floating on the surface of ponds with many imprisoned bubbles of gas. The filaments in these algæ are unbranched.

Confervoideæ, a somewhat ill-defined group of filamentous algæ, mostly living in fresh water, in which the branched or unbranched filaments have a mucilaginous sheath, and the chlorophyll is diffused throughout the cells. They are now divided into the *Isogamæ* and the *Heterogamæ*. In the former sexual reproduction occurs by the conjugation of similar ciliated zoospores; but the ordinary modes are asexual by the germination of zoospores or of detached resting-cells. *Conferva*, *Ulothrix*, *Chætophora*, *Chroolepus*, belong here. The *Heterogamæ* include *Œdogonium*, *Sphæroplea*, *Coleochæte*, etc., in which the conjugating bodies are dissimilar, and the female gamete is usually stationary.

Confession, in an ecclesiastical sense, signifies the avowal of sin, sometimes, as in early times, to the congregation at large, and sometimes to the priest, who is looked on as the vehicle of forgiveness. No ecclesiastical question has more heated men's blood, and it still forms an ecclesiastical "red rag." Private confession seems first to have become habitual about the fifth century; the Lateran Council of 1215 made it optional; the Council of Trent made it obligatory, or nearly so. Auguste Comte (q.v.) has strongly commended it.

Confessional, a word sometimes used to denote—among its enemies—the practice of auricular confession, but more specially signifying in ecclesiastical architecture a small building, generally of wood, within a church for the convenience of penitents and their confessors. It generally consists of a central compartment, in which the priest sits, and which has upon one or both sides a grating, which communicates with a recess occupied by the penitent, who makes his communication through the grating. The confessional has given occasion to the display of some exquisite wood-carving.

Confession of Faith in a wide sense denotes a creed or other embodiment of the religious faith of a Church, but it is often used in the more modified sense of a declaration of belief set forth by one or other of the Reformed Churches or Communities. These confessions are numerous and varied. The most notable are that of Augsburg in 1530, which was the first attempt at unity and conformity of doctrine among Protestants, and that of Westminster in 1647, which embodied the principles that governed Presbyterian practices.

Confidential. [Privileged Communication.]

Confirmation, the act of making a thing valid, a ratification. We speak of the confirmation of a treaty, of an appointment, of a rumour. In an ecclesiastical sense it signifies the laying-on of hands by a bishop upon a baptised person, being looked on in some churches as a Sacrament, by others as a pious practice. In the Eastern Church the rite is administered immediately after baptism, in the Western it is delayed for a certain number of years, the general test of fitness being the knowledge upon the part of the candidate of the responsibilities which he undertakes. In the English Church the age at which the rite is administered depends in a great measure upon the opinion of the officiating prelate, but the general tendency is to confirm at an earlier age than in the early part of the present century. Confirmation in the Church of England, though a usual, is not an indispensable preliminary to Communion.

Confucius, the Chinese philosopher, was born 551 B.C. in Chüeh, in the state of Lu, a component part of the existing province of Shantung. The name Confucius is Latinised from Kung Futsze, Kung being the family name of royal descent. While only three years of age Confucius was left with his mother in poor circumstances, his father

dying then. At the age of seventeen he became an inspector of the public corn stores, and at nineteen he married, his progeny being a son and two daughters. In 517 B.C. he began his career as a teacher, and in the same year visited the capital, where he fell in with Lao-tze, the founder of Taoism. After returning to Lu, and another short absence therefrom occasioned by some revolutionary disturbances, he at length, under Duke Ting, became in 501 B.C. governor of the town of Chung-too, where the effects of his sagacious administration soon became apparent. This led to higher appointments, and as minister of crime he became the practical ruler of Lu, with the result that it was the best governed state in China. This stirred up the envy of the rulers of neighbouring states, and means were sought to compass the downfall of Confucius. This was accomplished by playing upon Duke Ting, his chief, who in consequence gave himself up to dissolute courses, and became estranged from his great counsellor. Confucius accordingly left Lu in 497 B.C., and with a band of disciples sojourned in many different states. He rejected the offers of princes to settle in their kingdoms, strictly adhering to the condition that he should be free to carry out his own ideas of government. In 495 B.C. Duke Ting died, and his successor, in the tenth year of his reign, recalled Confucius, who, however, never again assumed the reins of government as before. He has left no work by his own hand expounding his moral and social systems. He revised, however, the ancient writings which comprise the canonical works of Confucianism, viz. the Yih-king, the Shu-king, the Shi-king, the Le-king, and the Chun-tsien; and is said to have written the Chun Chiu, an enumeration of the historical events of Lu from 722 B.C. to 481 B.C. Of himself there are copious details in the *Confucian Analects*, a compilation from the reminiscences of his disciples. His teaching has ever had a great influence upon the Chinese, who still honour him as a deity. The law enjoins that to him there shall be erected in every prefecture, sub-prefecture, district, and market-town, a temple, and twice a year the Emperor pays homage to Confucius. Yet at the close of his career Confucius regretted that his life had been a failure. [For his teaching *see* CHINA.] The representative of the descendants of Confucius enjoys thereby the title of duke, large estates, and ranks next to the members of the imperial house.

Congé d'Élire is a permission issued by the English Crown to a dean and chapter of the English Church to proceed to the election of a bishop. This permission is accompanied by a letter recommending the Crown's nominee, and a disregard of this recommendation subjects the electors to the penal provisions of the Statute of Præmunire.

Conger, a genus of marine eels, with four species widely distributed. The body is scaleless, the gape wide, the eyes large, the teeth in rows, one of which is so closely set as to form a cutting edge; the gill openings are large, and the pectoral and vertical fins well developed. *C. vulgaris*, the Conger, or Conger-eel, plentiful round the British coast, is the best known species, and is nearly universally distributed. The length may range from 3 ft. to 8 ft.; the general hue is pale brown above, dull white below, but the upper surface may be darker or lighter according as the fish lies among rocky or sandy surroundings. The flesh is coarse and little esteemed, but when dried and grated it makes excellent soup, and some of that sold as "real turtle" is said to be prepared therefrom.

Congestion. The undue accumulation of blood in any part of the body may be brought about by increased supply, through dilatation of the arterioles (*active congestion*), or by obstruction to the return of blood from the part (*passive congestion*). Active congestion may be regarded as the early stage of inflammation (q.v.). Passive congestion may arise directly from venous obstruction, or from interference with the general circulation, leading to impaired power of effecting the natural transmission of the blood through the various organs and capillary systems of the body, and to its accumulation in dependent parts.

Congleton, a market-town of England, in the county of Cheshire, is situated in the valley of the Dane, near the Macclesfield canal. Its manufactures are in cotton, ribbons, and silks; it has also salt-works and coal-mines in the neighbourhood.

Congo (properly *Mwishi-Kongo*, plural *Eshi-Kongo*, Congo People), an historical West African Bantu nation, who occupy the region traversed by the Lower Zaire, which from them takes the name of the river Congo. At the arrival of the Portuguese (1484), the paramount *mani* (king, emperor) exercised a nominal authority over six vassal princes, who, after their conversion (1487), received the Portuguese titles of Dukes, Counts, and Marquises. The mani became a sôva (Port. *soberano*, sovereign), and his capital, Banza-Congo (Ambassi), took the name of San Salvador, which it still retains. This place became a great centre of civilising influences, and its splendours (churches, convents, palaces) are described in glowing language by contemporary writers. Even after its destruction by the hordes of Jagga savages about 1550, it rose from its ashes more magnificent than ever, and at the beginning of the 17th century was a flourishing city of 40,000 inhabitants. But in 1636 a civil war broke out between the sôva and a powerful vassal, resulting in the triumph of the latter and the expulsion of the Portuguese. Since then San Salvador has again become a mere *banza* (native village), whose hovels are grouped round the scarcely visible ruins of its former greatness. But numerous reminiscences of Portuguese culture still survive amongst the Congo people, who are certainly the most civilised of all Bantu nations. Their language (Kishi Kongo) has been cultivated for over 300 years, and is the most polished and richest of all Bantu idioms; current along the western seaboard from Loango to Angola, and for about 150 miles inland. *See* Rev. W. Holman Bentley's *Dictionary, etc., of the Kongo Language;* London, 1887.

Congo, a river on the W. coast of Africa, in latitude 7° S., was discovered by Diego Cam about 1484. By the natives it was called Moenzi Nzadi or the "receiver of all the waters," and by the Portuguese Zaire. It was at one time supposed to be one of the mouths of the Niger, a theory that led to its exploration in 1816 by Captain Tuckey, who ascended it for about 170 miles. Dr. Livingstone in his investigations of the regions between Lakes Nyassa and Tanganyika came upon a river, the Chambezi; this he followed to Lake Bangweolo, and lower down traced it as the Lualaba as far as Nyangwe. From this point, in 1876, Stanley took up the course of the river discovered by Livingstone, and proved it to be identical with the Congo, the great equatorial river of Central Africa. The length of the Congo is estimated at about 3,000 miles, with a drainage area of upwards of 1,300,000 square miles. The volume of its waters exceeds the volume of the Mississippi, and with such momentum does it rush into the ocean that vessels sometimes enter its discoloured water 300 miles from its mouth. Of its many tributaries the most important are the Aruwimi, Kwa, and Welle-Mobangi. For 110 miles from its mouth it is navigable, when cataracts interrupt it. In its upper regions it again becomes navigable for steamers of a light draught. The importance of this great water highway was soon recognised, and in 1876 an international association, with the King of the Belgians as president, was formed with the aim of preserving the neutrality of the Congo area.

Congo Free State was the result of the efforts of the International Association just alluded to, and was recognised by the European Powers in 1884 and 1885, when its boundaries were settled. Among the conditions of its recognition by the Powers are that the rivers within it are free to all nations, that no duties be imposed on imports, and that the slave trade be suppressed. It has an estimated area of 802,000 square miles. The administration of its affairs is carried on from Brussels by three departmental secretaries under the King of the Belgians. The chief official in the state is resident at Boma. There are several other stations in the state for administrative and trade purposes. The revenue necessary for the public service is derived from a duty on exports, and an endowment of £40,000 a year conferred by the King of the Belgians. A railway is being projected. The chief articles of trade are palm-oil, ivory, india-rubber, orchilla, beeswax, and different gums. Bananas and other tropical fruits and plants are abundant; and though malarial fever is frequent on the coast, parts of the interior are habitable by Europeans. The natives are a peaceful race and given to trading.

Congo Snake, the name given by American negroes to *Amphiuma means*. [AMPHIUMA.]

Congregation (Lat. *grex*, flock), a collection of people or, indeed, other things. The word is used in the Universities to signify the body of regent masters of arts collected for voting and legislative purposes. It has also several ecclesiastical significations. In Rome it denotes the several committees of the College of Cardinals for different administrative purposes, *e.g.* the Congregation of Rites. Again, convents may group themselves together to form a congregation. In Scotland it was used to denote the body of those who subscribed the Covenant of 1557, the nobles who adhered being called Lords of Congregation. It is also used to denote sometimes the habitual, sometimes the casual, body of worshippers in any church or chapel.

Congregationalist, applied as an adjective to a body of Christian worshippers who look upon themselves as forming a community exempt from any other ecclesiastical authority than their own united opinion, and as possessing equal rights one among another. As a substantive it denotes a member of such body. Other bodies than the nominal Congregationalists hold the same democratic form of church government.

Congress (Lat. *congredior*), a meeting of delegates for the purpose of discussing questions, with a certain power of adopting measures which depend for their validity upon subsequent ratification by the delegating bodies. The Congress of Vienna in 1814–15 is an instance in point. The congress exists in other than political matters; the Social Science Congress and the annual Church Congress are instances. In the United States of America the word denotes the central legislative body of the Union, consisting of the Senate and House of Representatives. The American Congress resembles, in many respects, in its functions and action the British Parliament, though many topics which come before the latter are, under a Federal system, reserved for the State Legislatures. An *Act of Congress* is a legislative enactment of the two Houses, ratified by the President.

Congreve, RICHARD, Positivist thinker, was one of Dr. Arnold's pupils at Rugby, where he subsequently became assistant-master. In 1855 appeared his well-known edition of Aristotle's *Politics*, and in 1857 his pamphlets on *Gibraltar* and *India*, in which he denounced the British Empire in the East. Resigning the fellowship that he held at Wadham College, Oxford, he openly adopted the Positivist system about this time. Among his other writings are *Elizabeth of England*, *Our Foreign Policy*, and *Human Catholicism*.

Congreve, WILLIAM, dramatist, was born in 1670 at Bardsey, near Leeds, and educated at Kilkenny and Trinity College, Dublin. He subsequently entered at the Middle Temple, and began to devote himself to literature. His first work was *Incognita*, a novel of an amusing character, and published under the pseudonym of Cleophil. In 1693 was produced the *Old Bachelor*, under the auspices of Dryden, between whom and Congreve there existed great friendship, and this met with a brilliant success. It was followed towards the end of the same year by the *Double Dealer*, whose reception, however, was not so happy. At the "theatre in Little Lincoln's Inn Fields" in 1695, *Love for Love* was brought out and obtained for its

author still higher popularity, which was, if possible, added to in 1697 on the appearance of the *Mourning Bride*, a tragedy. *The Way of the World*, 1700, was his last production for the stage, though he continued to write verses, and in 1710 he published a collection of his poems and plays. This he dedicated to Lord Halifax, who had been an early patron and useful friend. He amassed a fortune, which, on his death in 1729, he bequeathed to the Duchess of Marlborough.

Congreve, Sir William, baronet, inventor of the rocket that bears his name, was born May 20, 1772. He began his career in the army, and in 1808 invented the Congreve rocket. He was elected a fellow of the Royal Society, and in 1812 was returned to Parliament for Gatton, succeeding his father in the baronetcy in 1814. He wrote *An Elementary Treatise on the Mounting of Naval Ordnance* (1812), and a *Description of the Hydro-Pneumatic Lock* (1815). He died in 1828 at Toulouse.

Coni, or Cuneo, a town of Italy, capital of the province of the same name, is situated in a fruitful region about 50 miles S.W. of Turin. It is a bishop's see, and its fine cathedral has been lately restored. The province covers an area of 2,756 square miles.

Conibos, a numerous South American nation occupying the valleys of the Western Peruvian Andes in the Upper Amazons basin; they are a branch of the widespread Antis family, and are described by M. P. Marcoy in *Tour du Monde*, vol. x. They are the *Conihuas* of the early Spanish writers.

Conicoid, or Quadric Surface, is a surface any section of which is a conic. Of such surfaces the sphere is an example, every section of this figure being a circle. An ellipsoid is another case; it somewhat resembles an egg in shape, but has three perfectly symmetrical axes at right angles to each other. Every section of an ellipsoid is an ellipse or oval, but there are two directions in every ellipsoid in which circular cuts may be made. The ordinary cone is another case of quadric surface; in fact, every conic section is so called because it may be made by cutting a cone. Among other quadrics we have the paraboloid or the hyperboloid. Certain special quadrics are obtained by rotating a conic about an axis of symmetry. These are termed *conoids*, or quadrics of revolution, and it is evident that all sections of such surfaces at right angles to the axis are circular. Of such we have the oblate spheroid if an ellipse rotate about its minor axis; the prolate spheroid if it rotate about its major axis; the sphere if a circle rotate about its diameter; and the cone if a line pair rotate about the bisector of the angle between the lines, the cylinder being a special case of cone. There are other conoids also.

Conics. [Cone.]

Coniferæ, the most numerous order of gymnosperms, including several hundred species of trees and shrubs, comprised in some 35 genera. They have generally a tap root; an exogenous stem of tapering form, branching freely in pseudo-whorls; leaves reduced to rigid needles, mostly evergreen; and unisexual, wind-pollinated flowers, the female ones forming a seed-bearing cone (q.v.). The wood, which often forms wide annual rings, has inconspicuous medullary rays, and consists mainly of tracheides with bordered pits. The leaves are broad in *Gingko* and *Araucaria;* deciduous in *Taxodium* and the larches; in whorls of three in juniper; and in clusters of two, three, or five, in the axil of a membranous scale-leaf in the pines. With the exception of the yew (*Taxus*) conifers abound in resin-passages both in their stems and in their leaves. There being no perianth or closed ovary, the ovules are naked, and the pollen-grain falls directly into the micropyle. The seeds are filled with archisperm, formed before fertilisation, and the cotyledons are often green before germination and deeply lobed, so that the order has been termed "polycotyledonous." Some species reach a large size, *Sequoia gigantea*, the Mammoth tree of California, attaining 450 ft. in height, with a diameter of 37 ft. at the base. Many kinds are valued as ornamental trees, and others yield turpentine, resin, pitch, oil, and timber. [Cedar, Cypress, Hemlock Spruce, Juniper, Larch, Pine, Spruce, etc.]

Conington, John, scholar, was born in 1825 at Boston in Lincolnshire. Educated at Rugby under Dr. Arnold and Dr. Tait, he was elected scholar of Magdalen College, Oxford, in 1843, and of University College in 1846, where in 1848 he was elected to a Fellowship. He chiefly devoted himself to English editions of the classical texts, the chief of which was his *Virgil*, published in 1861–68. He also rendered the *Odes of Horace* and the *Æneid* into verse. He died in 1869, having held the appointment of Corpus Professor of Latin since 1854, the year of its foundation.

Conirostres, a lapsed group of Passerine birds having the beak strong and conical, without a definite notch in the upper mandible. The Sparrow, Hawfinch, and Lark, are examples.

Coniston, Lake, in the county of Lancaster, England, is beautifully situated at the foot of Coniston Fells. It is five miles long, half a mile broad, and 260 feet deep. On its eastern bank stands Ruskin's house, Brantwood.

Coniston Beds, a great series of rocks upwards of 5,000 ft. thick, partly Ordovian and partly Silurian in age, which occupy a large area in Westmoreland. The lower division is the *Coniston limestone*, which rests on the great Ordovian volcanic series of the district. It contains corals, brachiopods, and trilobites, many of which are identical with those of the Bala limestone in North Wales, and in Furness it occurs as the *Ireleth limestone*. Above it comes a great series of dark grey coarse flags or sandy mudstones, the *Coniston Flags*, followed by tough sandstones and greywacke, the *Coniston Grits*. These beds contain graptolites and other fossils similar to those of the Denbighshire Grits and the Lower Wenlock series of the Silurian.

Conjugate, a term employed in geometry to denote certain pairs of points, lines, or surfaces that possess harmonic relations to each other. The harmonic conjugate of a point with regard to two others in the same line is that point the reciprocal of whose distance from the given point is the mean of the reciprocals of its distances from the other two. Conjugate diameters of a conic section are such that each is parallel to the tangents at the extremity of the other; each will bisect all chords parallel to the other.

Conjunction of two heavenly bodies occurs when the two are in the same meridian. If at the same time they have the same altitude they will be in a line with the earth. A body is in conjunction with the sun when it is in the same line with the sun and on the same side of the earth as the sun. It is in *opposition* when in the same line but on the other side of the earth. Thus the transit of Venus is the position of conjunction of that planet with the sun.

Conjunctiva, the mucous membrane of the eye and eyelids. It is described as being made up of three parts, named *palpebral*, *scleral*, and *corneal*. The *palpebral* conjunctiva lines the inner surface of the eyelids. The *scleral* conjunctiva is the portion which covers the sclerotic, the resistant supporting tissue of the eyeball, or "white of the eye" as it is termed. The *corneal* conjunctiva covers the anterior surface of the cornea, the transparent portion of the outer coat of the eyeball. These three portions are directly continuous with one another.

Conjunctivitis, or inflammation of the conjunctiva, is a very common affection. Several varieties of conjunctivitis are described. Catarrhal conjunctivitis ("blight") is peculiarly apt to affect children, and is, at any rate in some cases, contagious. The symptoms are photophobia (q.v.) and increased secretion. Purulent conjunctivitis is a much more serious disease in which the whole thickness of the conjunctiva is involved. There is no definite boundary line between severe cases of catarrhal conjunctivitis and slight cases of purulent conjunctivitis, but practically the two affections are sufficiently distinct and not apt to be confused one with another. One variety of purulent conjunctivitis is that which occurs in the new-born infant (ophthalmia neonatorum). If neglected it may lead to complete loss of sight. [Blindness.] Other varieties of inflammation affecting the conjunctiva are phlyctenular conjunctivitis and granular lids. In the treatment of catarrhal conjunctivitis the main points to attend to are the improvement of the general health, and the frequent application of some mild antiseptic or astringent lotion. In many instances the vision will be found at fault, and it may be necessary for the child to commence the use of spectacles. In purulent conjunctivitis the adequate application of local remedies, and the thorough removal at frequent intervals from the conjunctival sac of the secretion which is formed, are matters of supreme importance. Medical advice should be procured from the outset, as a few hours' delay in the treatment of acute purulent ophthalmia may mean the loss of eyesight.

Conkling, Roscoe, politician, was born in 1828, at Albany, U.S. Educated for the law, he was in 1858 returned to the House of Representatives. In 1867 he became a senator, and in 1881 resigned owing to a dispute with President Garfield. Meanwhile, his influence in the ranks of the Republican party had grown to such an extent that he was able to divide the party into the "Conklings" and "Anti-Conklings," or the "Stalwarts" and "Half-breeds," or, again, the "Machines" and "Anti-Machines." After his resignation, however, in 1881 he took no prominent part in politics, and died in 1888.

Connecting Rod, in *Engineering*, is a bar of wrought-iron or steel used as an intermediate link to convert the alternating straight-line motion of the piston into the rotatory motion of the shaft. Its one end grasps a cross-head at the end of a piston-rod, the other end holding a crank-pin which travels in a circle by reason of its rigid connection with the driving-shaft.

Connective Tissue. The connective tissues serve as a kind of framework or basis on which the body is moulded or built up; they are disposed between the various muscular, glandular, and nervous structures, connecting them one with another, whence the name connective tissues. The connective tissues are developed from mesoblast [Development]; they may be divided into three groups, connective tissue proper, cartilage (q.v.), and bone (q.v.). Connective tissue proper or fibrous connective tissue is made up of cells and intercellular substance. The chemical basis of the latter is composed of a material which yields gelatin on boiling. The cells are readily distinguishable on microscopic examination of such structures as tendon and cornea; while, to go to the other extreme, there are structures in which the matrix or intercellular substance reaches such a degree of development as to render it difficult to demonstrate the existence of cells at all. Several varieties of the connective tissues (apart from cartilage and bone) are described. White fibrous tissue occurs in tendons and fasciæ and beneath the epidermis; yellow elastic tissue is found in the coats of arteries and in certain elastic membranes; adenoid tissue is that which constitutes the framework of lymphatic glands; gelatinous tissue is found in the umbilical cord; and neuroglia in nervous structures.

Conoclypeidæ, an extinct family of irregular Sea-urchins [Echinoidea], of much interest, as they are intermediate between the toothed and toothless forms. They are provided with powerful ossicles supporting the teeth, which are, however, diminished in size; these members of this family also possess the star-shaped structure known as the "floscelle," consisting of five ridges and five depressions, all of which radiate from the mouth. This floscelle is the typical character of the toothless order, Cassiduloidea, in which the genus *Conoclypeus* and its allies were included before

the discovery of the teeth. There are no British representatives of the family, which was most abundant in the Eocene period in Central Europe.

Conodonts, minute fossil tooth-like bodies, about a line in length, generally with acute denticles or serrated edge and mainly calcareous in composition, which occur in Cambro-Silurian and Devonian rocks in England, Russia, and North America. They differ from the minute jaws of annelids in being calcareous rather than horny, and are considered with some certainty to be the teeth of cyclostomatous or lamprey-like fishes.

Conoid, a special type of quadric surface, exemplified by the sphere, spheroid, and cone. [Conicoid.]

Conolly, John, M.D., D.C.L., was born in 1795, and was educated for the medical profession at the University of Edinburgh. He settled in London, and devoted his attention to the treatment of insanity, as to which the public conscience was beginning to awaken. To him is largely due the more humane system now pursued in the management of lunatics. He was for many years physician to the Hanwell Asylum, the Asylum for Idiots, and other institutions. He wrote valuable works on the symptoms of madness, and the construction and management of asylums, besides contributing largely to scientific journals. One of his last literary efforts was a treatise on Hamlet's mental characteristics. He died in 1866.

Conrad, Marquis of Tyre, son of William, Marquis of Montferrat, entered the service of the Pope Alexander III., and fought against Frederick I. In 1186 he went to Syria and took part in the Third Crusade. On his way he assisted Isaac Angelus in the defence of Constantinople, and received as reward the hand of Theodora. Narrowly escaping capture at Acre, he threw himself into Tyre, then besieged by Saladin, and held the city till relieved by Richard Cœur de Lion and Philip Augustus. Proclaimed sovereign of Tyre, he aspired to follow Guy de Lusignan as king of Jerusalem, and would probably have done so had he not been assassinated in 1190 by emissaries of the Old Man of the Mountains.

Conrad I., Duke of Franconia, and grandson of the Emperor Arnulf, was elected to the imperial throne in 911, Otto of Saxony having declined the honour. But Henry the Fowler, Otto's son, intrigued against the new Kaiser, and breaking out into open hostility, defeated him near Merseburg in 915. Conrad died childless in 918, and on his deathbed recommended his rival for the vacant throne.

Conrad II., the Salic, belonged to the same family as the preceding, and was chosen Emperor in 1024. He reigned for fifteen years with considerable ability, waging a long and successful war against the princes of Saxony, subduing Bohemia, Poland, and Hungary, acquiring the kingdom of Arles, and suppressing serious disorders in Italy. To him the lesser nobles owed the reform that made their fiefs hereditary. He built the cathedral at Speyer, where he was buried in 1039.

Conrad III., of the Hohenstaufen or Swabian dynasty, succeeded Lothaire III. as Emperor in 1138. Henry the Proud of Saxony was a formidable competitor, and the struggle between the Saxon house of the Guelphs (Welf) and the Franconian house of the Ghibellines (Wibelung) dates from this period. Conrad crushed his opponent in the battle of Weinsberg (1140), and subsequently joined in the Crusades with Louis VII. of France. After an unsuccessful attempt to take Damascus, he returned to Germany in 1149, was again victorious over the Guelphs, and died in 1152, leaving as heir his nephew Frederick Barbarossa.

Conradin, or Conrad V., son of Conrad IV., was only two years old at the death of his father, and was brought up by Louis of Bavaria. This ill-starred prince, the last of the Hohenstaufens, was stripped of his possessions by Manfred, who in his turn had to submit to the spoliations of Charles of Anjou, whom the Pope invested with the kingdom of Naples. At the age of 16 Conradin endeavoured to recover his territory in Italy, but was defeated by Charles at Tagliacozzo, captured, and put to death (1268). His mother, who brought a sum of money from Germany for his ransom, arrived too late. She built therewith the famous convent Del Carmine, where her son lies buried.

Consalvi, Ercole, Cardinal, was born at Rome in 1757. Under Pius VI. and Pius VII. he rose to the highest dignities in the papal court, and was a firm opponent of the French Revolution and the rise of the Empire. In 1801 he was employed to negotiate the famous Concordat, and when his master found it impossible to keep terms with Napoleon, he insisted on being allowed to resign. During the abdication of Pius VII. he joined him at Fontainebleau, and on his return to Rome in 1814 resumed his duties as secretary of state. He represented the Holy See at the Congress of Vienna, and obtained valuable concessions for his government. He died in 1824, and was buried in the church of San Marcello at Rome. His memoirs possess considerable interest.

Consanguinity, or Kin, is the relationship existing between persons descended from a common ancestor. It cannot exist without a legal marriage. Consanguinity is either lineal or collateral. Lineal consanguinity exists between persons related to each other in the direct ascending line, as from son to father, grandfather, great-grandfather, etc., or in the descending line from great-grandfather to grandfather, father and son. Collateral kindred are those who, though they have the same blood derived from a common ancestor and are therefore *consanguinei*, do not descend one from the other. Thus brothers have the same blood and are descended from a common ancestor, but they are related to each other collaterally, and the children and descendants of each of them are all collateral kinsmen to each other. By the law of England, all persons related to each other by consanguinity or affinity nearer than the fourth degree of the Roman

law are prohibited from marrying except in the ascending or descending line (in which the case can hardly occur in the course of nature).

Conscience, HENDRIK or HENRI, was born at Antwerp in 1812, his father being French and his mother Flemish. In 1830 he entered the army, but the success of some popular songs by him led to his abandoning military life for literature. After a brief but painful struggle with poverty he produced in 1837 *In het Vonderjaer* (The Year of Miracles), a romance that met with great success, and encouraged his aspirations to make the Flemish language a literary instrument. *The Lion of Flanders* followed in 1838, and established his name. King Leopold looked with favour on his efforts, and not only gave him a professorship at Ghent, but appointed him also tutor to the royal family. In 1868 he became keeper of the Musée Wiertz at Brussels. Among his many works, several of which have been translated into English and French, the most remarkable are *A History of Belgium*, *The Executioner's Child*, *The Conscript*, *The Poor Gentleman*, *Blind Rosa*, *The Justice of Duke Katel*, and *The Peasants' War* (1879). He died in 1883. As a painstaking delineator of everyday life, a gentle and inoffensive humorist, and an enthusiastic cultivator of his native tongue, Conscience deserves high praise; but he lacked dramatic power and knowledge of character.

Conscience Money, an expression coined to represent sums sent anonymously to the Chancellor of the Exchequer by those who have unwittingly or wilfully defrauded Government of some of its dues. The name comes from the supposition that the sender of the money is impelled to this course by the stings of conscience. These stings, however, are seldom so keen as to lead him to reveal his name.

Conscription (Lat. *conscribo*, to enrol), a word used to describe the varying conditions of compulsory military service. England, owing in a great measure to its insulated position and its small army, has for a long time had little practical knowledge of conscription, but it may have to be adopted eventually, though at present our "voluntary" army is a standing wonder to Europe. A modified conscription existed earlier in the century in the shape of the pressgang for the navy and the ballot for the militia. By a law of 1860 there is still theoretically conscription for the militia, but the law is in abeyance. In Germany and France, where universal service, with a few exceptions, is obligatory, the practice weighs heavily, and though French patriotism makes it tolerable, German patriotism does not prevent many from avoiding their obligation by foreign residence. Conscription in theory seems just and reasonable, but practically it has many drawbacks, and may do much to hinder the trade of a country and the prospects of the conscripts.

Consecration, an ecclesiastical word of Latin derivation denoting the blessing or setting apart of a person, place, or thing for divine worship or other ecclesiastical purpose. The consecration is often solemnised by a bishop, as in the consecration of bishops, priests, and deacons, or of a church or churchyard or cemetery. At other times the function is discharged by a priest, as, for instance, in the operative words of the mass or the communion service, or the blessing of holy water or incense.

Consequential. [DAMAGES.]

Conservation, in *Physics*, a term employed at present in three definite connections to signify the impossibility of altering the quantity of certain existences in the universe. Each of these existences may be distributed in different ways, but the total quantity thereof cannot be changed. Taking them in the order in which the enunciation of the doctrine of their conservation has been formulated, we have: 1. *Conservation of Matter.* This doctrine has been reached by the investigations chiefly of chemists. Matter exists in the universe in various forms and with unequal distribution. Whatever process obtains to change the distribution or the forms of matter, whether this process be natural or artificial, it cannot change the total quantity of matter. Thus the burning of a candle involves the combination of particles of candle with particles of oxygen in the surrounding air. There is thus a redistribution of the matter in the system, and portions of that candle pass away in various directions. But every particle still exists; none are annihilated and none created afresh. [MATTER.] 2. *Conservation of Energy.* Energy is generally defined as the power of doing work, and this definition may be here accepted, though from the principle to be enunciated it is obvious that to do work is merely to transfer energy. But whatever energy may be defined to be, the total amount in the universe is held to be constant. If, for instance, a machine has a certain amount of energy given to it, by no means can we make it give out more than that quantity. This we learn by experience, and we argue its truth by reason of the applicability of the doctrine of conservation of energy to every case where results obtained theoretically may be tested experimentally. The doctrine being true, it is impossible to construct a machine that shall be in continual motion and that shall also do useful external work. For if its energy is partially given away less must remain. If the withdrawal of energy is continuous, it must ultimately lose its energy and be therefore motionless. So perpetual motion, as understood by the old philosophers, is an impossibility. [ENERGY.] 3. *Conservation of Electricity.* This has only of recent years been advanced by physicists. Whatever electricity may be, whether according to the one-"fluid" theory its effects are observable wherever it exists in quantity above or below the average, or according to the two-"fluid" theory the effects are observable where the two opposing principles do not neutralise each other, this doctrine of conservation of electricity states that like matter its total quantity in the universe is invariable and that its distribution alone varies. [ELECTRICITY.] The question of conservation of force was investigated experimentally by Faraday, but the results did not lead to any new development, Force is not an existence, but only a rate of change of energy. [ENERGY.]

Conservative, a word now used in politics to denote those who now represent the old Tory party. The word seems to have first been employed in 1830, and was looked on as a kind of slang word. In a wider sense it is used to denote that habit of mind that dislikes change if it can be avoided, and clings to old things. Mr. Hardcastle, in *She Stoops to Conquer*, was a typical Conservative in this sense.

Conservatoire, a word specially employed to denote an academy for the study of music. The conservatoires of Naples, Milan, and Paris have an especial renown, and the Royal College of Music in London fulfils the functions of a conservatoire. The word is not confined to the study of music, since Paris possesses a Conservatoire des Arts.

Considerant, VICTOR, born at Salins, France, in 1805, became a disciple of Fourier, whom he succeeded in 1837 as head of the French Socialists. In 1845 he founded *La Démocratie Pacifique*, as the organ of his party, and in 1848 was elected to the *Assemblée Nationale*, where he voted with the most advanced republicans. In 1849 he was charged with treason, took refuge in America, and in 1854 founded a colony in Texas, which proved a failure. Of his various publications the most important is *La Destinée Sociale.*

Consideration, the price, motive, or matter of inducement of a contract lawful in itself. The consideration is the very life of a simple contract or parol agreement; while a speciality, or contract under seal, does not require a consideration to make it obligatory at law, the law always presuming a sufficient consideration, which the parties, except in special cases, are estopped from denying. The law not only requires a consideration in the case of a simple contract (under which term is included all contracts not under seal whether oral or written), but that it should be valuable, *i.e.* a legal consideration emanating from some injury or inconvenience to the one party, or from some benefit to the other party. A good consideration, *i.e.* an equitable consideration founded upon mere love, affection, or gratitude, will not support a contract. The consideration of blood or natural love and affection, though it is an apt as well as sufficient consideration in certain classes of conveyances, is not any consideration whatever in the case of a simple contract, and will not suffice to sustain a promise, and the same may be said of all past considerations of a merely *moral* nature binding on the feelings or conscience of the promiser, but not of any legal obligation on him. And further, if the consideration (or the promise founded upon it) *is illegal*, whether as being contrary to some particular provision of the law or as being contrary to its general policy, or if the consideration (or the promise founded upon it) is of an immoral character, the contract is utterly void and of no effect, but a promise or contract that is merely *fraudulent* would be voidable only unless by some express enactment it was made absolutely void. The consideration in all cases must move from the promissee.

Consistory was the name given under the later Roman Empire to the emperor's council. It was adopted in ecclesiastical matters, and was used to denote an archbishop's council or court, and by extension came to be applied generally to a court of ecclesiastical law.

Console (derivation doubtful), a kind of bracket used in architecture to support a cornice or form a stand for other supporting purposes.

Consols, the shortened expression for the Consolidated Public Funds. Much inconvenience resulted from the varying conditions and modes of payment of interest of the money advanced for the purposes of the central government, and in 1749 the different accounts were grouped together in one general account at the Bank of England. Stock in the Funds cannot, generally speaking, be realised directly, except by the process of selling to a would-be holder. Government may, however, pay off at such intervals as may be convenient any part of the principal advanced.

Consonance, in *Acoustics*, the simultaneous combination of notes that shall produce harmonious effect. [HARMONY.]

Consort, the husband or wife of the reigning sovereign. In the case of a Queen Consort she is a public person, exempt and distinct from the King, and not, like other married women, so closely connected as to have lost all legal or separate existence during the existence of the marriage, for the Queen Consort is (and always has been) of ability to purchase lands and to convey them, to make leases, to grant copyholds, and do other acts of ownership (without the concurrence of her lord), which no other married woman can (or until very recently could) do, a privilege as old as the Saxon era. A Queen Consort has also many exemptions and minute prerogatives. She pays no toll, nor is she liable to amercement in any court. The husband of a queen regnant is her subject, as Prince George of Denmark was to Queen Anne, and as Prince Albert (under the title of Prince Consort conferred upon him by Act of Parliament in 1857) was to Queen Victoria.

Conspiracy, a combination or agreement between several persons to carry into effect a purpose hurtful to some individual or to particular classes of the community, or to the public at large; for example, to injure the public health by selling unwholesome provisions, to raise the funds by the propagation of false intelligence, to defraud some person or persons of his or their property, and the like, besides conspiracies to murder or to commit any other of the greater offences. One of the chief cases of this offence is that of falsely and maliciously conspiring to indict an innocent man. With respect to this offence of conspiracy in general (and not merely when it affects the administration of justice), it may be further remarked that it is deemed to consist rather in the guilty combination or agreement than in the act by which it is carried into effect, and therefore in an indictment for conspiring to do a thing in itself unlawful it has never been essential to allege that the thing was in fact done. A combination among workmen to raise the price of wages was once deemed to be a conspiracy,

though the same object if contemplated by a single workman would not have been criminal or even actionable. The law, however, as to efforts to obtain a rise of wages has been materially altered by the "Trade Union Act, 1871," which enacts that the purposes of any trade-union shall not, by reason merely that they are *in restraint of trade*, be unlawful, so as to render the members liable to prosecution for conspiracy or otherwise; and by the "Conspiracy and Protection of Property Act, 1875," an agreement or combination by two or more persons to do or procure to be done any act in contemplation or furtherance of a trade dispute between employers and workmen, shall not be indictable as a conspiracy, if such act committed by one person would not be punishable as a crime either by indictment or summary conviction.

Constable, an officer to whom our law commits the duty of maintaining the peace. The Constable of England or Lord High Constable, as he was called, was an officer of high dignity and importance in this realm about the time of Henry VIII., but since that period this particular office has been disused in England, except on great and solemn occasions. He was then the leader of the king's armies, and had the cognisance of all matters connected with arms and war. He also sometimes exercised judicial functions in the Court of Chivalry, where he took precedence of the Earl Marshal. His jurisdiction is partly now vested in the Court of Admiralty. Constables are of two sorts—*high constables* and *petty constables;* the former are appointed at the court leets of the franchise or hundreds over which they preside, or in default of that by the justices at the Quarter Sessions, and are removable by the same authority that appoints them. They have the superintendence and direction of all petty constables within their district, and are in some measure responsible for these latter. They have also other duties such as serving precepts and warrants on certain occasions. But the utility of these officers having become questionable, the justices of each county were directed by statute 32 and 33 Victoria, c. 47, to consider and determine whether it was necessary that the office of high constable of each hundred or other like district within their jurisdiction should be maintained, and provision is therein made for the abolition of such office in certain cases and for the transfer of the duties thereof to the clerk of the justices in each sessional division. The duties of petty constables are subordinate to those of the high constable, and of a less important character. There are also constables of castles, who are governors or keepers of the same, and whose office is usually honorary. [Policeman, Warrant.]

Constable, Archibald, was born at Carnbee, Fifeshire, in 1774, and was apprenticed early to a bookseller in Edinburgh. He took great interest in the business, being an assiduous collector of rare works bearing on Scottish history or literature. In 1796 he started on his own account as a publisher, and his liberality soon made him popular with authors. *The Farmers' Magazine*, *The Scots' Magazine*, *The Edinburgh Review*, *The Encyclopædia Britannica*, *The Annual Register*, and *Constable's Miscellany* were brought out by him, together with important works by Dugald Stewart, Playfair, Brown, and Leslie. But his greatest title to fame rests on his connection with Sir Walter Scott, which dated from 1802, when the *Minstrelsy of the Scottish Border* was produced, and extended until 1827, the date of his death. During the greater portion of this long period the relations between the author, the publisher, and Ballantyne, the printer, were quite amicable and straightforward. Scott, however, having inextricably involved himself with Constable, appears to have desired to free himself from his obligations, and to start a new business with John Ballantyne, the printer's brother, as its nominal head. The scheme ended in failure, and Constable generously rescued the partners from immediate disaster, but the commercial depression of 1825 overtook them all, and bankruptcy ensued, the liabilities amounting to a quarter of a million. Constable's health broke under the shock, and he died in 1827. [Scott, Ballantyne.]

Constable, Henry, born of a Roman Catholic family in Yorkshire about 1556, was educated at St. John's College, Cambridge, where, in 1579, he is thought to have produced the romance in verse and prose entitled *The Forest of Fancy*, and bearing the initials H. C. In 1592 appeared a volume of sonnets called *Diana*, displaying great power and skill, and three years later he wrote four splendid sonnets as an introduction to Sidney's *Apology for Poetry*. Suspected of treasonous correspondence with Mary Queen of Scots, he fled abroad, and roamed for several years in France, Italy, the Low Countries, and Scotland. In 1601 he returned to England, and was forthwith consigned to the Tower, but obtained his release in 1604. He died some time before 1616. "Diaphenia like the Daffadowndilly" with "Venus and Adonis" and two other of his poems were printed in *England's Helicon* (1600). His *Spiritual Sonnets* saw the light quite recently, and there are unpublished poems of his still in existence.

Constable, John, the son of a yeoman farmer at East Bergholt, Suffolk, was born in 1776. He acquired some knowledge of drawing and painting from Duntheme, an intelligent plumber, but his father kept him at agricultural work until 1795, when Sir George Beaumont sent him to London with an introduction to Farington. His talents were recognised, but he made slow progress. He exhibited in 1802, but it was only in 1811 that his picture of *Dedham Vale* attracted favourable notice. The knowledge of nature stored up in early life, and the laborious industry with which he essayed to reproduce on canvas the scenery of his native county now began to tell. In 1818 he had four fine works, including the *White Horse*, in the Royal Academy Exhibition, and was elected an associate. *Stratford Mill*, *The Hay Cart*, and *Salisbury Cathedral* were among his masterpieces at this period, and some of his works exhibited in Paris created a profound sensation, and won him

two gold medals. In 1825 he painted *The Lock*, one of his most characteristic pictures, and *The Cornfield*, produced in the following year, showed his powers under another aspect. In 1829 he was elected a Royal Academician in spite of much opposition. *The Valley Farm*, *The Rainbow*, and *Waterloo Bridge* are the chief specimens of his later manner. Whilst working with Lucas at his book of *English Landscape Scenery*, he broke down in health, and during the last four years of his life was a martyr to rheumatism and other ailments. In 1836 he lectured on art at the Royal Institution, but died suddenly in 1837. Truth to nature in tone rather than in detail was the aim of his endeavour, and an age that was dazzled by Turner's brilliant idealism did him but scant justice, especially as he confined himself within a somewhat narrow field. He was more generously appreciated in France; still his great merits never obtained recognition until years after his death. Enormous prices have recently been given for the best examples of his genius.

Constance, or KOSTNITZ, a city of the Grand Duchy of Baden, capital of the circle that bears its name, stands on the S. bank of the Rhine at its exit from the Lake of Constance. It was probably founded in the third or fourth century A.D., and in the sixth century became the seat of the Bishop formerly established at Windisch. The old walls still mark the limits of the ancient settlement, but the houses now extend into the large suburbs of Brühl, Kreuzlingen, Paradies, and Petershausen. Becoming an imperial city it rapidly rose in wealth and importance. The Gothic cathedral dates from the eleventh century, and many fine specimens of mediæval architecture, such as St. Stephen's church, the Dominican convent, the public mart, and the town hall, still adorn its streets. Here sat the famous council (1414–1418) that sent John Huss and Jerome of Prague to the stake. Constance was annexed by Austria in 1549, and handed over to Baden in 1805, when the great bishopric was secularised. The city is in communication by railway with Germany, Austria, and Switzerland, and has factories for silk and cotton goods, and for watches.

Constance, THE LAKE OF (Germ. *Bodensee*), lies on the N. side of the Alps, between Bavaria, Würtemberg, Baden, Tyrol, and Switzerland, but is mostly in German territory. It has an area of about 200 square miles, almost the same as that of the Lake of Geneva, and is 44 miles long by 9 miles broad in its widest part. Standing 1,300 ft. above sea-level, it has a depth of 900 ft. It is divided into the Boden-See proper and the Unter-See or Lower Lake. The waters are apt to rise and fall very suddenly, and are seldom frozen except in very severe winters. The shores, save at the upper end, are flat but fertile. The Rhine, entering it near Rorschach, flows out again at the city of Constance. Steamers ply on it daily.

Constant, BENJAMIN, was born at Paris in 1845, and after a course at the Beaux-Arts became a pupil of Cabanel. He began to exhibit in 1869, his first picture being *Hamlet et le Roi*. This was followed by *Trop Tard* and *Samson et Delilah*. The best known specimens of his style are *Femmes du Riff*, *Le Harem*, *La Favorite de l'Emir*, *La Vengeance du Chérif*, and a huge canvas displayed in the International Exhibition of 1878 and entitled *Mahomed II., le 29 Mai, 1453*, for which he received the Cross of the Legion of Honour. M. Constant has painted several fine portraits, and has of late occasionally abandoned his favourite field for other subjects such as *Orpheus* and *Theodora*.

Constant de Rebecque, HENRI BENJAMIN, was born of French Protestant parents at Lausanne in 1757. He studied at Oxford, Erlangen, and Edinburgh, making at the latter University the friendship of Erskine and Mackintosh. Going to Paris before the Revolution he allied himself with the chief liberal thinkers, and in 1795 settled down there as a supporter in the Assembly and in the press of moderate republicanism. Napoleon expelled him at the same time as his friend Madame de Staël in 1802, and he then found shelter at Weimar, where he enjoyed the society of Goethe and Schiller, translated *Wallenstein*, and wrote his romance *Adolphe*. The fall of the Empire brought him back to Paris, where he somewhat inconsistently supported the Bourbons at first, gave in his adhesion to Napoleon during the Hundred Days, and then yielded his allegiance to the restored king in 1815. Constant was in fact prepared to support a constitutional government under any leader, and to advocacy of his moderate views he devoted the rest of his life. Opposed to the reactionary policy of Charles X., he warmly approved of the offer of the throne to Louis Philippe, and became the president of the council, but died in 1830 immediately after the change of dynasty. His greatest work, *On Religion, considered in its Source, its Forms, and its Developments*, is a philosophical attempt to trace the various phases that religious sentiment has passed through in the history of mankind. It shows no open hostility to Christianity, but repudiates the supernatural in all creeds alike. His various political writings are summed up in his *Cours de Politique Constitutionelle*. As a debater and a talker he outshone most of his contemporaries. Many of his speeches, pamphlets, and letters have been published posthumously.

Constantia, a village in Cape Colony, South Africa, 12 miles S. of Cape Town, and under the E. flank of Table Mountain. The cultivation of the grape was started here early by the Dutch, and the district is celebrated for the rich, sweet wine that bears its name.

Constantina, a town in the province of Seville, Spain, 40 miles N.E. of the capital, and near the Sierra de Constantina, the range that separates Andalusia from Estremadura. The place is defended by a strong castle. It produces soap and leather goods, and has in its neighbourhood mines of silver-lead.

Constantine, the capital of the province of the name in Algeria, stands about 50 miles inland from the port of Philippeville on the site of the ancient Cirta, and occupies a rocky height, 2,100

feet above sea-level, being cut off on three sides by a deep ravine, through which flows the Rummel. The original town was destroyed by fire in 311 A.D., and Constantine the Great, who rebuilt the place, gave it his name. The stones of the existing walls, the old bridge over the ravine, a part of the kasba or citadel, now a hospital, are Roman. The streets and houses of the oriental town as it existed before French occupation are tortuous, dirty, and dilapidated, but the modern quarter is well laid out with broad thoroughfares, trees, and fountains. The Place Nemours and the Place du Palais are fine squares. Among the public buildings are the mosque of Souka-er-Rezel (1143), now transformed into a Catholic church, that of Sidi-el-Kattani, the great mosque (Djama-Kebi) on the site of an ancient Pantheon, the harem of Salah, and the town-hall. There are the usual schools, hospitals, and other buildings of a provincial capital. A considerable trade is carried on with the coast and the interior, and the chief manufactures are woollen goods and saddlery. Originally the residence of the kings of the Massylii and the birthplace of Massinissa and Jugurtha, it declined under Rome. Cæsar gave a part of the territory to Sittius, who founded the Colonia Sittianorum. It was destroyed in the rebellion of the usurper Alexander against Maxentius. Passing into Turkish hands, it became the seat of a bey under the Dey of Algiers, but in 1826 asserted its independence, which it maintained until conquered by Marshal Valée in 1837. The province has an area of 67,576 square miles, and is bounded E. by Tunis.

Constantine, the name borne by thirteen emperors who reigned at Rome or Byzantium between 306 and 1453 A.D., and of whom the most important were:—

Constantine I., FLAVIUS VALERIUS AURELIUS, surnamed "the Great," was born in Moesia in 274, being the son of Constantius Chlorus and the low-born Helena. He spent his youth in the service of Diocletian, and won high military distinction in the East, whilst his father was acting as vice-emperor in the west. On the abdication of Diocletian and Maximian (305), he joined Constantius at Boulogne, went with him to Britain, and, on his death at York, in 306, accepted the nomination of the army to his father's vacant throne. Galerius, however, refused to recognise him as Augustus, but allowed him the title of Cæsar. He married Fausta, the daughter of Maximian and sister of Maxentius (307), both of whom laid claim to the purple, as did also Galerius, Licinius, and Maximin. Maximian, having acted treacherously towards his son-in-law, was first dealt with, and, having been defeated at Marseilles (310), committed suicide. Constantine next invaded Italy, routed and killed Maxentius at the Milvian Bridge (312), and became master of Rome. It was in this expedition that the conqueror professed to have seen the cross in the sky with the inscription "In this conquer," and to have been converted to Christianity. Whether he was at any time a true believer is doubtful, but at all events in 313 he restored to Christians their rights, and secured for them toleration. For many years, indeed, until the Council of Nicæa in 325, he gave his support equally to Christianity and paganism, influenced, perhaps, by political considerations. It must be admitted, however, that all his reforms had a Christian tendency, though his personal conduct was far from being modelled on the lines of the Gospel. His adoption of the *Labarum* as his standard certainly dates from a later period. In 313 he engaged in hostilities with Maximin, who was crushed at Heraclea and destroyed himself. Galerius being dead, the empire was now divided between Constantine in the West and Licinius in the East. The latter married his colleague's sister, but in spite of this a war broke out in 314, and he was deprived of Illyrium, Pannonia, and Greece. For nine years there was peace, during which Constantine's wise policy strengthened and consolidated his dominions. Upon some obscure pretext Licinius was attacked and defeated at Adrianople in 323; Byzantium fell; the eastern empire was added to that of the west; and the victor assured his position by meanly slaying his vanquished rival. Though the remainder of his reign was exempt from war, it was stained by terrible bloodshed. His eldest son Crispus was put to death on a charge of treason and suspicion of incest. Fausta was killed for having falsely made the latter accusation, and the emperor's nephew, Licinius, perished in the same imbroglio (324). In 325 the Council of Nicæa was convoked, and Constantine henceforward showed more decided sympathy with the Church, though he looked on the dispute between Arians and Athanasians with the eye of a Gallio. The new capital was founded at Constantinople in 328, no pagan temple being permitted within its walls, and the city was dedicated to the Virgin in 330. Nothing worth record occurred in his later years. He was on the point of setting out to punish the rebellious king of Persia, when he died at Nicomedia in 337. He received the honour of apotheosis from his pagan subjects and of canonisation from the Church. His empire was divided between his three sons Constantine II., Constans, and Constantius.

Constantine VII., FLAVIUS PORPHYROGENITUS, the son of Leo VI. and his concubine Zoe, was born in 905 A.D. At the age of six he lost his father, and his father-in-law Romanus Lecapenus became his colleague and virtually his master until 944. The sons of Lecapenus then expelled their father, and were themselves banished by Constantine, who at last assumed his proper position. Though a weak ruler, he was a patron of literature and art, and he wrote a number of valuable treatises giving a fair idea of the times in which he lived. These include an account of the provinces of the empire and of the outlying nations, a system of administration, a description of the customs of the Greek Church and Court, two essays on military subjects, and a variety of other works, He was poisoned by his son Romanus in 959.

Constantine Nicolaievitch, the second son of the Czar Nicholas, was born in 1827, and,

having been trained by Admiral Lütke for the naval service, became grand admiral whilst a mere boy. He married in 1848 Princess Alexandra of Saxe-Altenburg. A strong supporter of the "Old Russian" party and a promoter of the war of 1854–6, he held command of the Baltic fleet at that period, and was successful in preventing any serious operations on the part of the Allies. In 1862 he became governor of Poland, and from 1865 to 1881 was President of the Grand Council of the Empire. In the latter year he was dismissed owing to a suspicion of revolutionary intrigues, but was subsequently restored to comparative favour. A life of great irregularity had shattered his constitution and impaired his mental powers. In 1890, whilst attending the army manœuvres, he was seized with raving madness, and died in seclusion in 1892.

Constantine Paulovitch, the second son of the Czar Paul I., was born in 1779. He adopted the military profession with much zeal, served in Italy in 1799, and greatly distinguished himself at Austerlitz in 1805. At the conclusion of the war he was appointed commander-in-chief in Poland, and started the repressive system that has been pursued with more or less consistency ever since. In 1820, though he had very early in life been married to Princess Juliana of Saxe-Coburg, he was permitted by the Greek Church to take a Polish lady as his wife on condition that he resigned all claim to the throne. This obligation he most honourably fulfilled, insisting on the succession of Nicholas, his younger brother, and turning a deaf ear to all remonstrances. His despotic and cruel policy brought about an insurrection in Poland in 1830, and he fled the country. The Czar appears to have felt that his brother was in fault, since he deprived him of all his offices and sent him into retreat at Bialystok, where he died of cholera in 1831.

Constantinople (Turk. *Stamboul* or *Istamboul*), the capital of the Turkish Empire, was founded by Constantine on the site of the ancient Megarian colony of Byzantium (q.v.) in the year 330 A.D., and was designated by him "New Rome," a title that is still preserved in ecclesiastical phraseology. The Turkish name is said to be a corruption of the Greek words εἰς τὴν πόλιν (*eis tēn pŏlin*). Constantinople proper or Stamboul

CONSTANTINOPLE. THE GOLDEN HORN.

stands on a promontory at the west of the entrance to the Bosphorus, being washed to the south by the Sea of Marmora, and to the north by the Golden Horn, an inlet said to derive its name from the shape of its antler-like branches, and sufficiently capacious to afford anchorage to the largest navies of the world. On the opposite side of this creek lie the large quarters of Galata and Pera (q.v.). The extreme eastern point of the promontory is occupied by the old Seraglio, which fills the place of the ancient Greek acropolis. Of the walls raised by Constantine no trace remains. They were built and manned by 40,000 Goths, who, as Arians, were not allowed within the Holy City, but lived in a district named Hexe-Kionia or Hexe-Marmora, an appellation preserved to this day in the form Alti-Mermer. The existing walls date from Theodosius II. (412), but were completed by various hands at different epochs. They consist of two inner lines with an outer ditch and rampart, and at intervals of fifty yards are strengthened by towers. The vast subterranean reservoirs are contemporary with these works. The position of the Imperial palace is marked by the mosque of

Ahmed, but in the 12th century the court was transferred to Blachernæ in the north-western quarter. The main streets are identical with those laid out by Constantine, and retain some traces of the ancient arcades. The city comprises like Rome seven hills with dividing valleys, and among the more important secular buildings or monuments may be noted the Babi Ali or Sublime Porte, or landward gate of the Seraglio, used as a synonym for the Ottoman Court, the Burnt Column, and that of Constantine, under which the instruments of the Crucifixion and the Palladium of Troy are said to be buried, the Seraskierate or War Office, the Aqueduct of Valens, the At or Horse Bazaar, the Fire Tower, the Maiden's Column, once dedicated to Venus, the Church of the Patriarchate, the palace of the Hebdomon, and the Pentapyrgion. Of the four or five hundred mosques included within the walls, many are desecrated Christian churches. Chief among these must be reckoned the mosque of St. Sophia or Aya Sofia Jamisi, begun in 532 on the site of an older structure reared by Constantine. Huge, unsymmetrical, and barbaric externally, the grand proportions of the dome, 180 feet high and 107 feet broad, the many-coloured marbles and mosaics that adorn the interior, and the columns pillaged from the noblest temples of Greece, Asia, and Egypt, render it one of the most remarkable examples of the Byzantine style. Brick is the chief material used in the construction, pumice stone for its lightness being largely employed in the upper part of the dome. Two bridges span the Golden Horn; the outer one —that of Karakeui—is comparatively modern; the inner or old bridge, though now rebuilt in iron, was originally constructed by the Sultan Mahmoud. The space between the two forms the commercial harbour, the port of war being situated higher up in front of the arsenal which stands on the Galata side. A large import and export trade is carried on chiefly by foreigners, the produce of the coasts of Asia Minor and the Black Sea, such as wool, mohair, skins, and grain, being exchanged for European manufactures. The bazaars are large and numerous, and there are many *khans* or warehouses. Steamers keep up communication with all the ports of Europe, and ply frequently to and from the suburbs and adjacent coast towns. In addition to the primary and provincial Mohammedan schools and religious seminaries, Government institutions exist for training students for the military, naval, engineering, and medical professions. The *Imarets* or poor-houses, about 300 in number, deserve notice. Of late years considerable improvements have been effected in the lighting and paving of the streets, and a tolerably efficient fire-brigade has been established. No city has been more sorely tried by war than Constantinople. In the fifth and sixth centuries it was frequently threatened, but not actually attacked by barbarian invaders. Between 668 and 782 it was thrice besieged by the Arabs. The Russians made four attempts on its walls in the two succeeding centuries. Then ensued the struggle for its possession between Greeks and Latins, and it was captured by Dandolo and Michael Palæologus. Lastly, after these assaults by the Turks it yielded to Mahomet II. in 1453, when the dispersion of its citizens and of its literary treasures brought about that great revolution known as the Revival of Letters. [BYZANTINE EMPIRE and ARCHITECTURE, GALATA, SCUTARI, TURKEY.]

Constantius, FLAVUS VALERIUS, often called Chlorus (*pale*), was born about 250 A.D., being the son of Eutropius, a noble Dalmatian. He was a soldier of high repute, and received the government of his native province. In 292 Diocletian and Maximian conferred on him as on Galerius the title of Cæsar, and assigned to him the administration of Gaul, Spain, and Britain He then divorced his wife Helena, and married Theodosia, Maximian's daughter, who became the mother of Constantine the Great. He succeeded Diocletian as emperor, and was proclaimed Augustus in 305, but died at York the next year.

Constants, in *Mathematics* and *Physics*, are those quantities which remain of the same value throughout the case studied. In discussing, for example, the motion of bodies on the earth's surface, the attraction due to gravity is very nearly constant, and will therefore produce a constant acceleration. But in discussing the effect of the earth's gravitation on other heavenly bodies the intensity of this acceleration varies; it can no longer be treated as a constant. The period of a sidereal day is almost exactly a constant. and it is by referring to such quantities, whose unchangeableness may be relied upon, that we are able to express the magnitudes of similar quantities in terms of a definite number of absolute units. If this day varied in duration, it would be a matter of difficulty to obtain a convenient standard unit of time. This illustrates the importance of such physical constants.

Constellations, the groups into which the stars have been divided by astronomers. Many of them, such as the Pleiades, Orion, and the Great Bear, were identified and named in early times. Ptolemy enumerates forty-eight constellations in his *Almagest*, twelve of which are in the zodiac, twenty-one in the northern celestial hemisphere, and fifteen in the southern. Some of the old ones have since been changed, and several new ones added. [STAR.]

Constipation, an undue retention of the contents of the lower bowel. In the healthy individual an evacuation of the intestinal contents should occur once daily and at a definite time of the day. Irregularity in this particular should on no account be permitted, for unless the habit of regulating the action of the bowels is acquired, a condition of "sluggish action of the bowels" or habitual constipation is apt to be set up, which engenders headaches and dyspeptic troubles innumerable. Unfortunately the remedy for such a condition of things is too often imagined to be the continued administration, as occasion demands, of some favoured form of pill, which, it is true, obviates the difficulty for a time, but which only leads to a continued recurrence of the trouble, and to the employment of more and more violent means of

securing the desired result, as the normal functions of the body are more and more perverted and interfered with. Given a condition of habitual constipation, the treatment should consist in a deliberate attempt on the part of the patient to effect a return to the natural condition of things, and the adoption of certain hygienic and dietetic rules will be of far more service than the employment of drugs. Chronic constipation is often found in those who lead a sedentary life, and some amount of regular outdoor exercise is useful in such cases; a morning bath is said to be beneficial. Slowly sipping a glass of water—on first rising in the morning—is of undoubted service; oatmeal, brown bread, or fruit should be liberally included in the daily dietary. Fruit may, with special advantage, be taken either before or with the morning meal. If the case is an obstinate one, it may be necessary to have recourse for a while to mineral waters, or to some such drug as that now very largely used, the liquid extract of cascara sagrada (dose, half a drachm for an adult). But such measures should be regarded as only temporary, and should in no way be allowed to interfere with the cultivation of regularity of habit. An occasional attack of constipation is most efficiently treated by half an ounce of castor oil or by a ten-grain dose of the colocynth and hyoscyamus pill of the British Pharmacopœia; in some instances an enema is of service; but none of these remedies should be habitually employed. The compound liquorice powder and Gregory's powder are useful aperients of a less active stamp than those already mentioned. In the case of children the routine use of drugs is especially to be avoided; for occasional employment a small dose of castor oil or a combination of grey powder and compound rhubarb powder may be recommended.

Constitution, in a political sense, is the general arrangement come to by a community of the principles which shall govern its internal administration, and which cannot be changed without some great internal commotion. Thus, in England, hereditary monarchy, government by party, responsibility of ministers to the country, are fundamental constitutional maxims. Being in a great measure of spontaneous growth, the British constitution is of somewhat vague and undetermined limits, and its name is sometimes used as a "bogey" for purposes of party warfare. Most foreign nations, however, have formal written constitutions. In a general sense the word is used to denote the fundamental principles of any community, and is also applied in the individual to express the uniform assemblage of bodily conditions which form his state of health, and depend partly on heredity and partly on circumstances of early life.

Construction of Arches. [ARCH.]

Consul, in Roman history, denotes one of the two officers who discharged the regal office in ordinary circumstances after the expulsion from Rome of the Tarquins and the abolition of the name of kings. In an extraordinary crisis the consuls were either superseded by a dictator, or extraordinary powers were given them under the formula "*videant consules ne quid respublica detrimenti capiat*" ("let the consuls take measures that the commonwealth take no hurt"). In later times the consulship became a merely complimentary office. In modern times the consul is an officer in a foreign port, town, or country, who is accredited by another country to represent its interests and to protect its subjects in such foreign land, and who exercises his functions by permission of the community to which he is accredited. Often the consul is replaced by a vice-consul, who is a native of the country in which he exercises his functions, and is connected with the country which he represents by mercantile transactions or the like. Consulships are of varying importance and emolument, and the duties are various, being of great number and importance where the consul is the only representative of a country. One of his ordinary duties is to report from time to time any circumstances he may observe as likely to affect the well-being, commercial or otherwise, of the country he represents. The title of First Consul was bestowed upon Napoleon the First before his assumption of Imperial rank.

Consumption, a popular term which may be considered as the equivalent of phthisis pulmonalis, one of the most fatal diseases in many parts of the globe, and notably so in this country. The mean annual death-rate from phthisis amounts to about two per 1,000 living persons; perhaps a better idea of the ravages worked by the disease may be obtained from a statement of the result of an elaborate calculation made from the Registrar-General's returns, which is that of 1,000,000 children born upwards of 114,000 die of phthisis. The growth of knowledge as regards the disease has been attended by many changes in nomenclature, and it may be well to briefly discuss the meaning of such expressions as consumption, phthisis, tubercular disease of the lungs, bacillary phthisis, and the like.

The term consumption was originally somewhat indiscriminately applied to several forms of disease in which wasting or emaciation was a prominent symptom. The patient was said to be consumptive, to be in a decline, or to be suffering from phthisis (a word derived from the Greek and signifying a consuming or wasting away). Inasmuch, however, as loss of flesh is a phenomenon common to so many forms of disease, in order to be more precise it became customary to indicate the particular part of the body which was supposed to be especially involved by the morbid process. Thus we still hear the expressions consumption of the bowels and consumption of the lungs (pulmonary consumption) used; and the terms phthisis laryngea and phthisis pulmonalis are not infrequently employed, to indicate that the main symptoms present point to implication of the larynx or of the lungs respectively.

The study of morbid anatomy revealed the fact that the progress of "phthisis" was in many instances associated with the development of what were called "tubercles." These tubercles were studied for the most part as they appeared in the lungs, and they were described as being of two

varieties, the grey miliary tubercle and the yellow cheesy tubercle. Laennec maintained that tubercles were deposited from the blood, that at first they formed minute grey rounded semi-transparent masses (miliary tubercles), and that these by their coalescence and by the occurrence of degenerative processes gave rise to the opaque yellow masses. From the resemblance of the latter to cheese the degenerative process was spoken of as caseation. Laennec's views met with much opposition, it being held that the sequence of events detailed by him only obtained in a limited number of instances, while it was maintained that in many cases the caseous masses resulted from chronic inflammation of the lung substance, altogether apart from the deposit of miliary tubercle. The application of the microscope to the study of the diseased tissues threw further light on the matter, and for a while it was held that true pulmonary phthisis was distinguishable in all cases by certain definite microscopical appearances, the most characteristic of which was the presence in the midst of the growing tubercle of what was known as a "giant cell." Difficulties presented themselves, however, in connection with this solution of the question, and until a few years ago it was still maintained by many that the tubercle was the result of previous inflammation, and not that, as Laennec held, the inflammatory processes were caused by the deposit of tubercle. In other words, Laennec's attempt to define the condition of things by the naked-eye appearances of the diseased lung, and the further attempts to define it by the special microscopic appearances, were held not to cover all the ground, and something was yet wanting to establish the new species of disease. Meanwhile, the inoculability of tubercle was demonstrated, its infectious nature began to be discussed, and at length came the discovery which seems to have solved the problem. Koch in 1882 announced that the disease was due to a micro-organism, the bacillus tuberculosis. The new test was soon found to eclipse all that had preceded it, countless observers have verified by the methods elaborated from that originally employed by Koch, the invariable presence of this bacillus in the affected tissues in the type of malady under consideration ; and it is now customary to class as a definite species of disease all those cases in which the existence of the bacillus can be proved.

Of course it must be borne in mind that the bacillus tuberculosis attacks other organs besides the lungs ; indeed, the pulmonary mischief rarely presents itself without co-existing involvement of other parts of the body. In other words, the lung disease is part and parcel of the general affection tuberculosis. Still, for convenience sake, it is well to adopt a term for those instances where lung symptoms predominate, hence the retention of the expressions phthisis pulmonalis (or simply phthisis) and pulmonary consumption. If it be desired to indicate that the disease is associated with the presence of Koch's bacillus, the adjective bacillary is sometimes employed, to exclude certain maladies in which wasting accompanies lung disease, and there is no evidence of the existence in the diseased tissues of the typical micro-organism.

Causation. Few situations are absolutely free from phthisis. On the whole it is more common in temperate climates than in very cold or very hot regions. Mountainous districts often enjoy comparative immunity, and the researches of Buchanan and Bowditch have proved the common association of marked prevalence of the disease with dampness of soil. As regards sex, males are more frequently affected than females, if ages between five and twenty-five years, in which the reverse holds, be excepted.

The disease affects persons of all ages ; very young children are, however, rarely attacked, and the mortality is at its maximum in people between 35 and 45 years of age. Heredity appears to act as a predisposing cause. The influence of occupation is marked ; those employed indoors in crowded workrooms, and persons exposed to an atmosphere charged with mineral or organic dust, are specially liable to attack. Insufficient ventilation is known to be a factor of immense importance apart from other defects, as is clearly shown by the evidence afforded by barrack rooms, back-to-back houses, and the overcrowded alleys and courts of great cities. Phthisis has been attributed to the consumption of the milk and flesh of animals affected by the bacillus, and probably with justice. The relative immunity of the Jewish race may be alluded to in this connection. As regards the influence of season of the year, it may be remarked that the largest number of deaths occur in the spring months.

Symptoms. The most common early symptoms are cough and loss of flesh. There may be spitting of blood, and sometimes an attack of hæmoptysis (q.v.) is the earliest indication to cause alarm ; the larynx may be involved almost from the first, giving rise to loss of voice ; vomiting sometimes occurs, and some febrile disturbance may be noted. The symptoms of the established disease are continued cough with mucopurulent, perhaps blood-stained, expectoration, hectic fever, with night sweats, and rapid loss of flesh. The circulation is enfeebled, dropsy may be present in slight degree, and a characteristic clubbed condition of the ends of the fingers is frequently produced. Diarrhœa may be exceedingly troublesome. The patient is often exceedingly hopeful as to the result of his illness, even when his condition is obviously becoming more and more serious.

The development of tubercle elsewhere than in the lungs may considerably modify the aspect of the disease ; laryngeal, cerebral, renal, and peritoneal complications may be specially alluded to. The physical signs of consumption cannot be discussed here in any detail. Suffice it to say that tubercular mischief is more apt to occur at the apices than in other portions of the lungs. If râles are detected on auscultation over the upper parts of the lung on either side and remain limited to such situation, the circumstance is regarded with the utmost suspicion. When the tubercular infiltration has made some progress, and when the affected portions of lung commence to break down with the formation of cavities, definite alterations in the percussion note and character of the breath

and voice sounds heard over the site of the mischief occur. The diagnosis is definitely confirmed in many instances by the discovery of the presence of the tubercle bacillus in the sputum.

The treatment of phthisis may be considered under two heads: preventive and curative. Preventive treatment will doubtless receive much more attention in the immediate future than has hitherto been accorded to it. The remarkable reduction of the phthisis death-rate in the army as the result of the adoption of improvements in ventilation and of an increased allowance of cubic space per head in barracks points in an unmistakable manner to the desirability of devoting attention to such matters. Moreover, phthisis is an infectious disease, and should be treated as such. Next to nothing is being done at the present time in the way of securing the disinfection of sputum, and the question of the communicability of the disease through the medium of milk, meat, and the like is only just beginning to force itself to the front. As regards curative treatment, it is now fully recognised that consumption in its early stages at any rate is not necessarily a fatal disease; much depends, however, upon the circumstances of the patient. If he can be removed to favourable hygienic surroundings, and can be well fed and cared for, there is a considerable chance of arresting the progress of the mischief. It is obvious, however, that to winter in a mild climate, or to go on a sea voyage, are plans of treatment beyond the reach of the majority of sufferers. In the case of workers in towns of scanty means the conditions are, it must be confessed, very unfavourable; still even here if the disease be incipient, and the best precautions available be taken, a successful result may be hoped for. If the mischief is of some standing, the look-out is very bad save for those who can afford to completely change their conditions of life.

Since the establishment of the bacillary origin of the disease many attempts have been made to devise some plan of attack which should prove fatal to the micro-organism, without injury to the patient. The so-called antiseptic treatment of phthisis seems to have done some good; the latest method devised by Koch in 1891 seems to have been somewhat prematurely adopted, and to have led to no beneficial result.

Contagion. [Infection.]

Contarini, the name of an illustrious family of Venice, members of which have won renown as doges, senators, cardinals, painters, and professors. Andrea Contarini, elected doge in 1367, defeated the Genoese at Chiozza, and rescued the republic from impending subjection. He died in 1382. Domenico Contarini was doge in 1659, when the Turks were besieging Candia, which surrendered to them in 1667. He died in 1674.

Contempt of Court. A contempt of a court of law is a disobedience to the rules, orders, or process of the court, or a disturbance or interruption of its proceedings. Contempts by resistance to the process of a court, such as the refusal of a sheriff to return a writ, are punishable by attachment, but contempts committed in the presence of the court which cause an obstruction to its proceedings in the administration of the law, may be and frequently are punished by the immediate committal of the offender to prison or by fining him. The power of enforcing their process and of vindicating their authority against open obstruction or defiance is incident to all duly-established courts of justice.

Conti, Louise Marguerite of Lorraine, Princess of, was the daughter of Henry, Duke of Guise, and by her beauty and wit attracted the admiration of Henry IV., who would have married her. She allied herself, however, in 1605 to Francis, Prince of Conti, and on his death in 1614 married Marshal Bassompierre, whose disgrace she shared, dying in 1631. She left a diverting *History of the Amours of Alcander the Great*, the king being designated by this transparent pseudonym.

Conti, Prince of, a title borne by the younger branch of the house of Bourbon-Condé since 1551, when the seigneurie of Conti or Conty, near Amiens, passed into possession of the family. Armand, Prince of Conti, was born in Paris in 1629, being the younger brother of the great Condé, with whom he was imprisoned for a time owing to participation in the intrigues of the Fronde. Mazarin subsequently released him, and gave him his niece as well as the governorship of Guienne and Catalonia. He was the author of several works on manners and morals, dying in 1666. Francis Louis, son of the preceding, was a distinguished soldier, and fought at Fleurus and Neerwinden. At the death of Sobieski (1697) he was elected king of Poland, but was ousted by Augustus II. He died in 1709. The last member of the family died at Barcelona in 1814.

Continent, in *Geography*, is a term of somewhat vague import, but defined as being a tract of land nowhere entirely divided by the sea. Formerly geographers reckoned four continents—Europe, Asia (which really form one), Africa, and America. To these have been since added Australia and the supposed continent of the Southern Polar regions. The English use the word in a special and restricted sense to denote the rest of Europe.

Continental System, a principle of isolation which Napoleon endeavoured in 1806 to establish by a paper blockade to prevent other European nations from having commercial intercourse with England. This Berlin decree was met by the English Government issuing, in 1807, an order in council which inaugurated a system of reprisals. This was further met by Napoleon with the Milan decree of 1808 of a still more stringent nature. Both decrees and orders set utterly at naught the international rights of neutrals, who were the chief sufferers. Russia's refusal to accede to Napoleon's views led to the disastrous Moscow campaign. The principle of paper blockade has now been generally abandoned.

Contingent Remainder. [Remainder.]

Contour-lines on a map or plan are lines of

constant level. If one were to travel along a contour-line, the route followed would be horizontal. Contour-lines are very important for maps of hilly districts. Paths of quickest descent are at right angles to the contour-lines and are exemplified by the courses followed by streams of water.

Contraband, in international law, such goods as are prohibited to be imported or exported, bought or sold. either by the laws of a particular state or by special treaties; also a term applied to designate that class of commodities which neutrals are not allowed to carry during war to a belligerent power. It is a recognised general principle of the law of nations that ships may sail to and trade with all kingdoms, countries, and states in peace with the countries whose flags they bear, and that they are not to be molested by the ships of any other power at war with the country with which they are trading unless they engage in the conveyance of contraband goods. The question whether certain goods (other than munitions of war as to which there is no question) are or are not contraband is often a very difficult one. Generally speaking, it depends partly on the practice of each nation and partly on stipulations in treaties.

Contract, an agreement between competent persons upon a legal consideration to do or to abstain from doing some act. The term is usually employed to designate only simple or parol obligations, which comprehend not only verbal and unwritten contracts, but all contracts not of record or under seal. Contracts are divided into three classes. 1. *Contracts of record*, such as judgments, recognisances, and statutes staple. 2. *Specialities* which are under seal, such as deeds and bonds. 3. *Simple contracts*, or contracts of parol. Every contract is founded upon the mutual agreement of the parties. When the agreement is formal, and stated either verbally or in writing, it is called an express contract; when the agreement is matter of inference and deduction, it is called an implied contract. In its widest sense agreement is not a technical term, and all agreements are not legal agreements. People may agree about many things without intending thereby to create any legal obligation; for instance, persons may agree to take a journey together, or to form a party of pleasure. Those agreements which are intended to produce legal obligations, and are adapted to produce such obligations, are contracts. All contracts are agreements, but all agreements are not contracts. A contract always effects a legal obligation either on one side or on both, but obligations may arise in other ways than by contract. [CONSIDERATION.]

Contractile Vacuole, the structure in the PROTOZOA which is supposed to act as the excretory organ. In *Amœba* (q.v.), for example, there is near the centre of the protoplasmic mass of which it consists, a clear round body which appears to alternately expand and contract; this is the contractile vacuole. In Amœba it appears to be simply due to the gradual growth of a single drop of fluid; in other forms, as in the "Slipper Animalcule" (*Paramecium*), it is formed by the union of several droplets; these commence at first as mere lines radially arranged around a minute central cavity; the lines expand into pear-shaped bodies; these fuse at their thicker inner ends to a central vacuole; this continues to grow, the radial lines disappear, and the whole vacuole finally bursts; its contents are thus discharged. The function of the contractile vacuole is thus the expulsion of superfluous water; the soluble excretory products are doubtless dissolved in this water, while other insoluble innutritious particles have been observed to collect in the vacuole and are thus also got rid of. In some Protozoa, such as the "Bell Animalcule" (*Vorticella*), there is a special "vacuolar duct," into which the contractile vacuoles discharge.

Conulariidæ, an extinct family of Pteropods (sea butterflies) occurring in the Cambrian and Silurian systems. They were provided with shells, and attained much larger dimensions than any living representatives of the class. The reference of these fossils to the Pteropods is, however, not free from doubt.

Convection, in *Physics*, a process of altering the distribution of heat in a system by actual conveyance. A body may impart some of its heat to another by giving heat to the air particles in its immediate neighbourhood, these particles then carrying the heat to the other; such a process is termed convection, and is of much importance in nature. By convection the upper layers of water in a kettle that is being heated from below are themselves heated. Similarly an electrical body may lose its electricity by touching and electrifying neighbouring particles of air, which then carry off the electricity elsewhere. This process is observable in the Brush discharge (q.v.).

Convent is an ecclesiastical word used to denote a community of religious persons of either sex, who unite together to carry on a common life in obedience to a fixed constitution and in observance of a fixed discipline. Among Protestants the word is often restricted to a community of nuns, the word monastery being used to denote a community of men; but there is no such real distinction.

Convention sometimes signifies an agreement, whence our use of the adjective conventional to denote what is in accordance with the tacit principles governing society. In a political sense the word is used to denote an informal parliament, which assumes power during an interregnum, and whose measures require the later sanction of a properly formed parliament in order to have legal force. Such a convention arranged the return of Charles II., and such another bestowed the British Crown upon William of Orange. In the United States, "State Conventions" are the assemblies occasionally elected to revise the State Constitutions, while party conventions meet for various purposes, especially to settle the nomination for the presidency.

Conversano, a town in the province of Terra di Bari, Italy, 20 miles S.E. of Bari. It is the seat of a bishopric, and possesses a cathedral, castle, foundling asylum, hospital, and several convents.

Wine, oil, almonds, and cotton are produced in the neighbourhood.

Conveyance, Conveyancing. A conveyance is a deed or document by which property is conveyed from one person to another, whether by grant, assignment, appointment, lease, settlement, or otherwise. Conveyances of real property operate either according to the rules of common law or under the "Statute of Uses." The most important statute as regulating the present system of conveyancing is the "Conveyancing and Law of Property Act, 1881" (44 and 45 Vict. c. 41), the principal object of which was to shorten deeds by several enactments, which prescribe that certain general words, covenants, and conditions theretofore used by conveyancers in the preparation of deeds should be implied by virtue of the Act, *unless* the parties stipulate to the contrary. Short forms of statutory mortgage transfer and reconveyance are scheduled in this Act, also short forms of mortgage, further charge, conveyance on sale, and marriage settlement. The "Solicitors' Remuneration Act" of the same year brings into use an entirely novel mode of remunerating solicitors for conveyancing business, the same being by way of commission upon the amount of purchase-money or rent, etc. Both Acts were originally introduced by Lord Cairns. The former Act also contains important provisions against forfeitures of leases, the powers and duties of mortgagors, mortgagees, trustees, and executors, the management of the property of married women and infants, and the recovery and redemption of rent-charges, and it sanctions the residue of long terms. *i.e.* a residue of not less than 200 years of a term originally created for not less than 300 years, to be converted into a fee simple.

Convocation was formerly the name of a provincial ecclesiastical synod. In England the word denotes an assemblage of prelates and inferior clergy, who are summoned by the authority of the Crown, and have not so much legislative power as a certain influence upon the consciences of churchmen. There are two convocations, one for each of the provinces of Canterbury and York, presided over by the archbishops of those provinces respectively. The Convocation of Canterbury sits in two houses; the upper consisting of bishops—formerly of mitred abbots also; and the lower of elected representatives of the clergy, and these houses deliberate apart. The Convocation of York is similarly constituted, but the two bodies do not sit in separate houses. Convocation is generally summoned and prorogued concurrently with Parliament. In 1717 the Bangorian controversy (q.v.) caused the Crown to prorogue it (though it still sat formally), and it was only revived in 1851. Formerly it had the power of taxing the clergy for the purposes of the country, but since the Restoration the clergy have fallen under the general scheme of taxation.

Convolvulus, a genus comprising about 100 species, forming the type of the order *Convolvulaceæ*. They are slender twining or trailing plants with a milky juice, and often containing a purgative resin. They have scattered, exstipulate leaves; no bracts below the calyx; a conspicuous funnel, belt, or trumpet-shaped corolla of five united petals; five stamens and a two-chambered ovary containing four seeds. With the pink and white-flowered *Convolvulus arvensis*, a pretty cornfield weed, are commonly united the forms with two large bracts below the calyx, sometimes known as *Calystegia*, including the large white *C. sepium* and the pink sea-side *C. Soldanella*, both British. *C. tricolor*, a native of the Mediterranean region, with blue flowers with a white and yellow centre, is commonly known in gardens as "Minor Convolvulus." The root of *C. Scammonia* yields the purgative drug scammony.

Convoy, the name applied sometimes to ships of war which are employed in war time to escort merchant ships from port to port, and sometimes to the merchant vessels so escorted. While the duty of the warships is to protect their charge, the duty of the latter is to use their best endeavour not to part from the escort. If it can be proved that such parting is owing to wilfulness or neglect, no claim for insurance on account of damage which may have happened in consequence will hold good.

Convulsionnaires, a sect which sprang up among the Jansenists in France in 1730, and which centred itself around the memory of one Francis of Paris, at whose tomb miracles were alleged to take place. The sect was the victim of one of those apparently hysterical seizures which have inexplicably cropped up from time to time in Church history, whence their name. Voltaire said that the grave of Francis of Paris was also that of Jansenism.

Convulsions, a term applied to violent involuntary contractions of groups of muscles. In *tonic* convulsions one set of muscles is affected by contraction for a sensible period, while in *clonic* convulsions groups of muscles of more or less opposite action are alternately involved by spasmodic contraction, producing, for example, flexion and extension of parts of the limbs in rapid succession to one another. The convulsions of epilepsy and of uræmia will be treated of under these heads. [CHOREA, HYSTERIA.] Convulsions may result from organic disease of the brain, and may be associated with the puerperal state. *Infantile convulsions.* Children are peculiarly liable to convulsive seizures, the onset of acute disease, for example, which is so often attended by a rigor or shivering fit in an adult, may in a child be accompanied by convulsions. Again, during teething and in association with rickets they may occur. In the treatment of "fits" in children it is usual to adopt certain remedies, the most popular of which is the warm bath; it must of course be borne in mind, however, that the fit is, as a rule, merely a symptom of some disease, and the chief point is to make out in the first instance what that disease is.

Conway, or ABERCONWAY, a port in Carnarvonshire, N. Wales, on the W. bank of the estuary of the river Conway, 12 miles S.E. of Bangor. It is an ancient Celtic settlement, and was fortified by Edward I. (1284), whose massive castle still stands

on a rock commanding the river, and is connected with the old walls, a mile in circumference, that surround the town. Among other buildings of the Elizabethan period the town contains Plas Mawr, a fine house belonging to the Mostyn family. Telford's suspension bridge (1826) and Stephenson's tubular bridge (1848) are interesting specimens of engineering skill. The trade is inconsiderable, and the prosperity of the place depends chiefly on its attractions as a resort for holiday-makers. Conway was formerly one of the Carnarvon parliamentary boroughs, but in 1885 was thrown into the Carnarvon district.

Conway, HENRY SEYMOUR, Field-Marshal, the second son of the first Lord Conway, was born in 1720, and adopted the military profession. He was aide-de-camp to the Duke of Cumberland at Culloden, and as lieutenant-general served with distinction under Prince Ferdinand of Brunswick in 1761. He next entered Parliament, and was Secretary of State from 1765 to 1768. He then returned to the army, of which he became commander-in-chief in 1782, when he proposed in Parliament the abandonment of the American war. Though able, courageous, and cultivated (Horace Walpole was his close friend, and he wrote a play), he lacked the vigour necessary to achieve greatness. He died in 1795.

Conway, HUGH, the *nom-de-plume* under which Frederick Fargus won considerable popularity as a writer of sensational romances. Born in 1840, and brought up to business at Bristol, Fargus wrote in 1883, for *Arrowsmith's Annual*, a highly melodramatic story entitled *Called Back*. The success of this clever but by no means elevated specimen of fiction was extraordinary. Next year the author produced *Dark Days*, a far less striking performance. In 1885, whilst *A Family Affair*, which showed signs of higher artistic capacity, was appearing in the *English Illustrated Magazine*, Mr. Fargus was seized with typhoid fever and died at Monte Carlo. A few posthumous sketches of moderate merit have appeared since his death.

Conway River takes its rise from Lake Conway on the borders of the counties of Merioneth, Denbigh, and Carnarvon. Flowing first N.E., then N.W. and N., it divides the two latter counties, drains the picturesque Vale of Conway, and after a course of 30 miles discharges its waters into Beaumaris Bay. It is navigable for vessels of 100 tons for a distance of 10 miles from its mouth.

Cony, Coney, a Middle English name for the rabbit (q.v.). The word occurs in the Authorised and Revised Versions of the Bible, where it translates the Heb. *shaphan*, probably the Syrian species of Hyrax (q.v.).

Conybeare, THE VERY REV. WILLIAM DANIEL, F.R.S., was born in 1787, and educated at Westminster and Christ Church, Oxford, where he took high honours. He devoted himself to the study of geology, just at that moment coming into prominence as a science. With Dr. Buckland he made a survey of the north of Ireland. In 1821 he constructed the skeleton of the Plesiosaurus, and in 1822 brought out, in conjunction with Phillips, the *Outlines of the Geology of England and Wales*. He held for many years the rectory of Sully, Glamorganshire, delivered the Bampton Lectures in 1839, and in 1847 was appointed Dean of Llandaff. He died in 1857.

Conybeare, THE REV. WILLIAM JOHN, son of the preceding, was born about 1815, and was educated at Trinity College, Cambridge, where he obtained a fellowship. He was appointed principal of the Liverpool Collegiate Institution, and in conjunction with the Rev. J. S. Howson wrote *The Life and Epistles of St. Paul*, a work that has been received with much favour. He was the author of a remarkable *Essay on Church Parties* in the *Edinburgh Review*, of a novel entitled *Perversion*, and various essays and sermons. He died in 1857.

Cook, DUTTON, the son of a London solicitor, was born in 1832, and educated for his father's profession. His bent, however, was towards literature, and after some success as a novelist, his chief productions being *Paul Foster's Daughter* (1861), *Hobson's Choice* (1866), and *Over Head and Ears* (1868), he was appointed assistant editor of the *Cornhill Magazine*. He next turned his attention to dramatic criticism, and worked on the staff of the *Pall Mall Gazette* until 1875, subsequently joining the *World* as a writer on dramatic and artistic topics. Besides contributing to many periodicals, he brought out in his later years two successful stories, *The Trials of the Tredgolds* and *Doubleday's Children*. He died in 1883.

Cook, ELIZA, was born in Southwark in 1818, being the daughter of a well-to-do merchant. She began to write in her childhood, and at an early age contributed tales, verses, and articles to *The New Monthly Magazine* and other periodicals. In 1838 she published a volume of poems under the title of *Melaia and Other Poems*. A second volume appeared in 1864, and a third, called *Diamond Dust*, in 1865. From 1849 to 1854 she edited *Eliza Cook's Journal*, but gave it up owing to failing health. Her style is simple, not to say common-place, but it attracted the uncritical public, with whom her songs such as "The Old Arm Chair" and "Home in the Heart" were great favourites. She died in 1889, having for five-and-twenty years enjoyed a pension of £100 on the Civil List.

Cook, JAMES, a distinguished navigator, was born of humble parentage at Marton, Yorkshire, in 1728, and at the age of 13 was bound apprentice to a small shopkeeper. A year and a half later he obtained his discharge, and went to sea in a collier as a foremast man. In 1755, being then a master, he volunteered to serve in the navy, and joined the *Eagle*, 60, Captain Joseph Hamer. He was promoted to be master in 1759, and served in the *Mercury* with the expedition against Quebec. Here he first gave proof of his great abilities, and was employed in surveying the St. Lawrence. He afterwards surveyed the coasts of Newfoundland. In 1768, a commander being required for a vessel which was to be sent to observe a transit of Venus in 1769, Cook was given a commission as lieutenant

and appointed to command the *Endeavour*, which he navigated *viâ* Rio Janeiro to Otaheite (where the transit was observed), New Zealand, and home by Batavia and the Cape of Good Hope. This obtained him in 1771 promotion to the rank of Commander. In 1772 he was given command of a new expedition consisting of two small vessels, the *Resolution* and *Adventure*, and he proceeded again to the South Seas, where he made many discoveries, and whence he returned in 1775. For this service he was made a post-captain, and appointed Captain of Greenwich Hospital; and in 1776 he was made a Fellow of the Royal Society. In the meantime Cook had sailed on his last expedition. After demonstrating the impracticability of a northern passage between the Pacific and the Atlantic, and making many fresh discoveries in the Pacific, he lost his life on Feb. 14, 1779, at Owyhee in the Sandwich Islands during a fray with the natives. He was a man of genius, self-denial, devotion, and natural kindness of heart; but he had too little command of his temper. Had he been less hasty and more tactful, it is probable that he would not have lost his life as he did.

Cook, Mount, or Rorangi the culminating point of the Southern Alps, in the province of Canterbury, South Island, New Zealand. It has an elevation of nearly 12,460 feet, and its summit is clothed with perpetual snow, the glaciers exceeding in size any that exist in Europe. Like the other mountains of New Zealand, it is of volcanic origin.

Cook, Richard, R.A., was born in London in 1784, and, after a course of training in the Academy schools, began to exhibit in 1808, dealing chiefly with scriptural subjects. In 1816 he was chosen Associate and in 1822 Royal Academician, after which date he exhibited no more, being a man of private means. Besides illustrating Scott's *Lady of the Lake* and *Gertrude of Wyoming*, he is only known to have painted thirty-five important pictures. He died in 1857.

Cooke, Sir Anthony, was born about 1506, and, having acquired in early life a high reputation for morality and learning, was appointed tutor to Edward VI. On the accession of Mary, his Protestantism and the support he gave to Lady Jane Grey led him into voluntary exile, from which he returned in 1558. Of his three daughters, Mildred married Lord Burleigh, Anne Sir Nicholas Bacon, father of Lord Bacon, and Elizabeth a son of the second Earl of Bedford. He died in 1576.

Cooke, Benjamin, born in London in 1739, received a musical training from Pepusch. In 1752 he was appointed conductor of the Academy of Ancient Music, and held the post for thirty-seven years. In 1762 he became organist of Westminster Abbey. He composed some excellent Church music, but is remembered chiefly for his delightful glees *How sleeps the brave? Hark the Lark! In the Merry Month of May*, etc. He died in 1793.

Cooke, George Frederick, was born in Westminster in 1756, and brought up as a printer, but took to the stage. He made his first appearance in London at the Haymarket theatre in 1778, but met with little appreciation. He then made himself a considerable name in the provinces and especially in Dublin. In 1800 he once more appealed to the London public in *Richard III.*, and was received with enthusiasm. For ten years he was regarded as second only to John Kemble. He was induced to go to America in 1810, and died there in 1811, his irregular habits having broken his magnificent constitution. Edmund Kean caused a monument to be erected on his grave.

Cooke, Thomas Potter (T. P.), the son of a surgeon in London, was born in 1786. Losing his father early, he went to sea and served in the Mediterranean until the Peace of Amiens. In 1804 he appeared on the stage of the Royalty theatre, and soon became a popular melodramatic actor. One of his most popular impersonations was William in *Black-eyed Susan* (1829), and he was greatly applauded as Long Tom Coffin in *The Pilot*, when he danced his famous hornpipe. For many years he was in high favour at Astley's and the Surrey, dying in 1864.

Cookery. It has been said that cookery is the most ancient of the arts, and that it has rendered more important services to society than any other art, because it was in the preparation of food that man learned to use fire, and it is through using fire that he has subdued nature. Even those who consider these claims on behalf of cookery to be extravagant must acknowledge that until the use of fire was discovered the knowledge of cookery was unknown, for cookery is neither more nor less than the application of heat to food, to make it more palatable and more digestible. The appreciation of cookery has varied in different ages and different countries according to the degree of culture possessed by the people of those countries. Amongst the ancient Greeks it was highly esteemed. Poetry and music were associated with the pleasures of the table, and we read in Homer that Achilles and Patroclus took part in cooking the food for a banquet given in honour of royal guests. From ancient books also we learn that Cadmus, who introduced into Greece the Phœnician characters from which the Greek alphabet was derived, had been cook to the King of Sidon. The Romans were less refined in their ideas of cookery than the Greeks; they believed in abundance of luxury more than in delicacy of flavour, and were proud of the costliness of their viands, while occasionally their luxury assumed grotesque forms. Thus we read of banquets where dishes were served whose sole merit was their cost, as the dish composed of the brains of 500 ostriches, or that in which were seen the tongues of 5,000 singing birds. The ancient Britons, on the other hand, knew little of cookery. They lived chiefly on coarsely bruised barley mixed with milk.

Amongst modern nations the French are the most celebrated for their skill in cookery. Until quite recently all but the very wealthy amongst the English were notoriously ignorant of the art.

Of late years, however, more attention has been bestowed on it, and vigorous efforts have been made by persons interested in the public welfare to make the general public realise the importance of the subject. This is a cause for congratulation, for, as Count Rumford said, "Cookery and agriculture are arts of civilised nations, savages understand neither of them." Cookery certainly deserves to be studied with the greatest care. The number of inhabitants which may be supported in any country upon its internal produce depends as much upon the state of the art of cookery as upon that of agriculture.

There are six different ways of cooking food, and they are termed processes of cookery:—(1) Broiling, (2) roasting, (3) boiling, (4) stewing, (5) frying, and (6) baking. Of these *Broiling* is the most ancient, the most simple, and the most nutritious, because when well done the natural juices of the meat are best retained by it. *Roasting* may be described as most wholesome, and when not understood thoroughly the most difficult to accomplish. A great cook, Brillat Savarin, used to say, "Cookery is an art, but to roast requires genius." Curiously enough, English cooks who fail with all other modes of cookery are often skilled in roasting. *Boiling* is the easiest mode of cookery, and it is most often badly done. *Stewing* is the best process for digestion, and it consists in cooking the food at the lowest temperature possible. *Hashing* is the same process applied to meat already cooked. Food thus prepared is less nourishing and less wholesome than food freshly cooked. *Frying* is the most speedy mode of cookery, and food cooked thus is very tasty. There are two ways of frying, the wet method, when the article to be cooked is immersed in very hot fat; the dry method, when it is tossed over the fire with very little fat. *Baking* is the most convenient mode of cookery. It is very similar to roasting, the difference between the two being that in roasting the food hangs in the open before a bright fire, in baking it remains motionless in a confined space. Consequently, the volatile fatty acids which are generated do not escape. It may be roughly calculated that animal food loses one-fourth of its weight by being cooked.

Cook's Islands, or THE HERVEY ARCHIPELAGO, lie in the Pacific Ocean (lat. 18° to 22° S., long. 158° to 162° W.), S.W. of the Society Islands. Their total area is 300 square miles, and the chief members of the group are Mangeia, Raratonga, Aitutake, and Auotu. Discovered by Captain Cook in 1777, they became in 1823 the scene of the missionary labours of John Williams; many of the natives are now Christians. Though water is scarce, vegetation is luxuriant, bread-fruit, cocoa-nuts, and plantains being the chief products. The inhabitants are chiefly Malays, and their industry and mechanical skill raise them above the level of most of the Polynesian races.

Cookstown, a market town on the river Ballinderry in the N.E. of co. Tyrone, Ireland. It is 158 miles from Dublin by railway, and 53 miles W. of Belfast. Linen is the staple manufacture, and there are large bleaching works, with flax and corn mills. Killymoon Castle is near the town.

Cook Strait, the channel that divides North from South Island, New Zealand, was discovered by Captain Cook in 1770 and named after him.

Coolies, from a Hindoo word meaning labourers, is applied generally to Eastern labourers, who are carried to different colonies and countries whose climate is unfitted to European labour, and where native labour is not to be obtained. The coolies are in the majority of cases Chinese, and their employment has given rise to such a rush of Chinese immigrants to various parts as to make their admission to a country one of the most important international and ethnical questions of the day. Many coolies have also been brought from the South Sea Islands under contracts which bind them to a certain number of years' service at a certain rate of pay. Till governments began to look into things, there was much abuse of this coolie-supplying system, and the "blackbirding" of the South Sea Islands was hard to distinguish from the old slave-trade.

Coomassie, or KUMASSI, the capital of Ashanti (q.v.), West Africa, stands on a low rocky eminence, surrounded by a dense jungle and pestilential swamps, about 130 miles N.N.W. of Cape Coast Castle. It was founded by Sy Tutu in the middle of the eighteenth century, and is about $3\frac{1}{2}$ miles in circumference, with broad, regular streets and stuccoed houses painted red and white. The British, under Wolseley, captured the place in 1874 and destroyed the palace, a large and strong building, close to which is the grove where many human victims were annually slaughtered. A considerable trade is carried on with the interior, and the wealthier inhabitants use gold freely for ornamental purposes.

Cooper, SIR ASTLEY PASTON, BART., was born at Brooke, Norfolk, in 1768, and after studying surgery under Clive and John Hunter, became demonstrator of anatomy at St. Thomas's Hospital (1787), professor at Surgeon's Hall (1792), surgeon to Guy's Hospital (1800), and professor of comparative anatomy at the College of Surgeons (1813). His skill as an operator, and his scientific knowledge, placed him at the head of his profession. In 1820 he treated George IV. with success and received a baronetcy, which descended to his nephew, as he had no children. He was elected president of the College of Surgeons in 1827, and was honoured with many other distinctions. His few published works deal with professional subjects. He died in 1841, and was buried in the chapel at Guy's Hospital; but a monument was erected to his memory in St. Paul's Cathedral.

Cooper, JAMES FENIMORE, the son of a judge in New York, U.S.A., was born at Burlington, New Jersey, in 1789. Having been educated at Yale College he entered the U.S.A. navy, but retired and married in 1811. He published anonymously in 1819 *Precaution*, a fashionable novel, which was hardly a success. In 1821 appeared *The Spy*, a far more popular effort, and this was followed by *The Pioneers*, *The Pilot*, and *The Last of the Mohicans*. His fame was becoming widespread, when in 1826

he passed over to Europe, and produced *The Prairie* and *The Red Rover*, two of his most vigorous works, with others that hardly enhanced his reputation. Whilst living in Paris he was drawn into a controversy as to the political constitution of the United States, and after writing numberless letters in the Press, he wrote three novels—*The Bravo* (1831), *The Heidenmauer* (1832), and *The Headsman of Berné* (1833), with the avowed intention of decrying aristocratic institutions. Returning to America he carried his polemics with him, and for some years was engaged in acrimonious disputes, in which his vanity and bad temper were more conspicuous than his talent. To this period belong *Monikins*, *The American Democrat*, *England*, *Homeward Bound*, and *Home as Found*. The severe handling which he received from the critics provoked him to bring a series of actions for libel, and in these he came off with flying colours. He then recovered public favour by reverting to his early style in *The Pathfinder* (1840), *The Deer Slayer* (1841), *The Two Admirals* (1842), *Wyandotte* (1843), *Afloat and Ashore*, and *Miles Wallingford* (1844). From his facile pen, however, came several more solid compositions, such as *A Naval History of the United States*, and *Lives of Distinguished American Naval Officers*, with several books recording his European experiences. He resumed his controversial tone in *The Littlepage Stories* (1845–6). *Oak Openings*, *Jack Tier*, *The Sea Lions*, and *The Ways of the Hour*, occupied the closing years of his life. He died in 1851 at Cooperstown, a village founded by his father on Lake Otsego.

Cooper, Thomas, poet and journalist, was born in 1805 at Leicester, and brought up at Gainsborough. At 15 he was apprenticed to a shoemaker, but devoted every spare moment to study. In 1829 he became a schoolmaster, and soon afterwards a provincial journalist. The trial of Frost converted him to Chartism (q.v.), and in 1841 he was condemned to two years' imprisonment for sedition and conspiracy in connection with the Potteries' riots. In prison he wrote the *Purgatory of Suicides*. For a time a Methodist local preacher, he eventually rejected Christianity, but returned to it in 1855, and afterwards frequently lectured on Christian evidences. His autobiography appeared in 1872.

Cooper, Thomas Sidney, R.A., was born at Canterbury in 1803 of humble parents. From 1823 to 1827 he earned a scanty livelihood as drawing-master in his native town. He then worked his way to Brussels where his talents found appreciation and his bent for animal painting was developed. In 1830 he returned to England, and exhibiting first in the Suffolk Street Gallery in 1833, secured the patronage of the founder of the Vernon Gallery. He sent nothing to the Royal Academy until 1840, and by that time his marvellous skill in depicting cattle, sheep, and goats in combination with landscape and rich, warm atmospheric effects had successfully appealed to the public taste. In 1845 he was elected an associate, but the full title of Academician was not conferred on him until 1867. He gave to the world in 1890 an interesting history of his own career.

Cooperage (from Dutch *koopen*, to buy), a system of barter carried on upon the high seas, principally by Dutch and Belgian vessels, which patrolled the North Sea and provided the North Sea fishers with goods, especially spirits and tobacco, in return for money, gear, or fish. So much evil in the shape of drunkenness, waste of stores, and disposal of fish resulted from this practice, that a determined set was made against it by deep-sea missionaries and smack owners, and they have endeavoured to enlist the efforts of the Governments concerned towards discouraging this practice and establishing a properly-regulated trade where necessary.

Cooper's Hill, a sandy elevation rising 142 feet above the Thames on its S. bank, and close to the Berkshire border of the county of Surrey. It commands a fine view over the Thames valley. There since 1870 has been established the Government Civil Engineering College, destined originally to train young men for the public service in India, but now thrown open to all who desire a professional education. The spot was immortalised by Pope and Denham.

Coordinates, in *Mathematics*, are measurements that fix the position of a point, line, area, or volume. Thus, the position of a point on this sheet is determined if we know its distances from the top edge and from the left-hand-side edge. So, also, a point in a room is found when we know its distances from the floor and from two walls that meet each other. The discussion of the properties of figures by investigating the coordinates of their constituent points belongs to *Coordinate Geometry*.

Coorg, formerly an independent principality on the E. side of the Western Ghâts in Southern India. Since 1834 it has been a province of British India. It is very mountainous, having a mean elevation of 3,000 feet, and is drained by the Cauvery and its tributaries, which are frequently rendered torrents by the heavy rainfall amounting annually to 160 inches. Owing to humidity, dense jungles and bamboo forests cover much of the area, but recently these have been cleared away, to the improvement of the climate, which is not unhealthy. The inhabitants are a fine race of agriculturists. The Kodagas are the chief tribe. Being of Dravidian origin they speak a Canarese dialect, retaining their primitive devil-worship and several peculiar customs, such as the community of wives between the brothers of a family. Throughout the district are great artificial ramparts (Kunnidegs) of unknown origin. Coorg preserved its independence from 1583, or earlier, to 1773, when Hyder Ali seized on the country and imprisoned the young rajah, who, however, escaped and joined the English in breaking Tippoo's power. But alleging the misrule of a later sovereign as a pretext, Lord William Bentinck dispatched General Fraser in 1834 to annex the country. The area of the province is about 1,600 square miles. The exports are rice, coffee, and cardamoms, coarse blankets being the only manufacture.

Coot, any bird of the aquatic genus Fulica of the Rail family. There are ten species, world-wide in distribution, and distinguished by a lobed membrane on the toes, and a large frontal shield. The common coot (*F. atra*) is a native of England, frequenting marshes, lakes, and gulfs, but visits Scotland only in the summer. It is also common over the European continent. The length is about 16 inches, general plumage slaty-black, bill, frontal shield, and narrow band on the wings white. The flesh is little esteemed for the table. Coots make a large nest of water-plants, and lay from seven to ten eggs, which are brownish-white with dark brown spots.

Coote, General Sir Eyre, K.C.B., the son of an Irish clergyman, was born near Limerick in 1726, and entering the army early served against the Pretender in 1745. In 1754 he joined Clive in India, was promoted to the rank of colonel for his services at Plassy, and in 1760 was sent to the Carnatic, where he defeated Lally at Wandewash. He returned to England, received the thanks of Parliament and a diamond-hilted sword from the directors of the Company, and in 1769 was raised to the chief command in Madras. Quarrelling with the governor, he again came home and for several years held the governorship of Fort St. George. He went out once more in 1780 as commander-in-chief under Warren Hastings, and next year defeated Hyder Ali at Porto Novo. He then paid a visit to Calcutta, and was on his way back to Madras when his ship was chased by a Frenchman. The indignation at this misadventure brought on apoplexy, of which he died in 1783.

Copaiba, or Copaiva Balsam, a pale yellow, unpleasantly aromatic, bitter oleo-resin which exudes copiously from incisions in the stems of the Brazilian leguminous trees *Copaifera Lansdorffii*, *C. officinalis*, *C. Martii*, and *C. guianensis*. It is shipped from Para, Maracaibo, and Bahia, our imports reaching about 500 cwt. annually. It is used in making printer's ink, and in medicine as a stimulant, cathartic, and diuretic.

Copal, a resinous substance which occurs as an exudation from certain trees in the East Indies, S. America, and other tropical regions. It hardens by exposure to air, and comes into commerce as smooth, yellowish, translucent lumps. Its solution in turpentine, or other volatile solvent, is largely used as a transparent and almost colourless varnish.

Coparceners, Coparcenary. An estate held in coparcenary is where lands of inheritance descend from the ancestor to two or more persons. It arises either by Common Law or by particular custom. (1) By *Common Law*, as where a person seised in fee simple or in fee tail dies and his next heirs are two or more females—his daughters, sisters, aunts, female cousins, or their representatives—in this case they all inherit, and these coheirs are termed coparceners or, for brevity, parceners only, though in some points of view the law treats them as making together only one heir. (2) Parceners by *particular custom* are where lands descend, as in gavelkind, to all the males in equal degree as sons, brothers, uncles, etc. [Common Law, Gavelkind.]

Cope (Lat. *cappa*), a large outer cloak, at first an article of ordinary attire, but later adopted and retained as an ecclesiastical vestment worn by a priest or higher dignitary in processions and at solemn services other than the mass. But in the English Church its use by the celebrant at the eucharist was prescribed by the 24th Canon of 1603 in cathedrals and collegiate churches. The practice of wearing it prevailed till the end of the eighteenth century, and in accordance with recent decisions of the ecclesiastical courts its use has been revived, not without some heartburnings and warm expressions of feeling. The cope is semicircular in shape, the curved side forming the bottom and the neck of the wearer coming at the centre of the diameter. A clasp or other joining called a *morse* is sometimes employed to secure the cope. The material is often silk, and its embroidery and ornamentation have given scope for some of the most valuable examples of ecclesiastical art. The colour of the vestment varies with the season or with the occasion of its wearing. From the substantive is derived a verb meaning to cover as with a cope, and used chiefly in architecture as "coping," "coping-stone." Another verb, "to cope," is connected with the Dutch *koop*, trade, and signifies *to bargain*, whence the expression *horse-coper*, and the phrase *to cope with* in the sense of to oppose successfully, to be a match for.

Cope, Charles West, born 1811 at Leeds, received his education as a painter at the Royal Academy, and in Italy and the Netherlands. At the age of twenty he began to exhibit pictures illustrative of history or of dramatic scenes. He was elected A.R.A. in 1844, and at the same time received a commission to execute the eight frescoes that adorn the Peers' corridor at Westminster. The full distinction of R.A. followed in 1848. From 1867 to 1874 he was professor of painting in the Royal Academy. He died in 1890. As his artistic career covers a period of over half a century, his works are very numerous. Among the later ones may be mentioned *Launcelot Gobbo's Siesta*, *The Taming of the Shrew*, *The Good Shepherd Giveth His Life for the Sheep*, and *Anne Page and Slender* (1882). In colouring and style he approaches Mulready, displaying less brilliancy but more correctness.

Cope, General Sir John, K.C.B., appears to have entered the army in 1707 and to have been colonel of the 7th Foot. He was in command of the king's forces in Scotland when the rebellion of 1745 broke out, and fell back before the Pretender as far as Preston Pans near Edinburgh. Here he trusted to a marsh to protect his front, and was consequently surprised and defeated. Though acquitted by a council of inquiry, he was much blamed for this disaster, but was afterwards employed in Ireland. He died in 1760, and his fame is preserved in the popular Scottish song, "Johnnie Cope."

Copelatæ, a division of ascidians (q.v.), distinguishing the Appendicularia (q.v.) or tailed sea-squirts, from the Acopa.

Copenhagen (Dan. *Kiöbenhavn*, Lat. *Hafnia* or *Haunia*), the capital of Denmark, stands on the islands of Seeland and Amager or Amak at the S.W. extremity of the Sound. Copenhagen proper occupies a low-lying tract in Seeland, separated from the sea by the lagoons of St. Jörgens Sö, Peblings Sö, and Sortedams Sö. It was surrounded by a strongly fortified wall, now almost wholly demolished, and is divided by the Gothers Gade into the old town to the E., a mass of crooked and densely-populated streets, and the new town to the W., regularly laid out with wide thoroughfares and fine modern buildings. A commodious harbour is provided by the Channel between Seeland and Amager, and is protected by the impregnable fortress of Frederikshavn. The fine palace of Christiansborg, rebuilt in 1828 and decorated with sculptures by Thorvaldsen, looks over the fort, but the residence of the royal family is at Amalienburg in the new town. Two bridges span the Channel and lead to the quarter of Christianshavn on Amager. In the Frederiks-square, besides the dwelling-place of the sovereign, stand four other palaces, and to the north lies the Rosenburg palace designed by Inigo Jones and surrounded by handsome gardens. There are several spacious markets, a noble university, and many public schools, a town hall, exchange, academy of arts, royal library, hospitals, theatres, and other public buildings. Most of the open spaces are adorned with statues. The cathedral (Frue Kirke), of Græco-Roman style, stands in the place of the old structure destroyed by the bombardment of 1807, and contains some fine sculptures. St. Peter's church, a Gothic building, dates from 1585, and the round tower of Trinity church, ascended by a spiral pathway and designed by Tycho Brahe for an observatory, is a remarkable specimen of architecture. Many other places of worship exist, including a Greek and an Anglican church, the latter founded by the Princess of Wales. The Thorvaldsen Museum is a splendid monument to the great national artist. The harbour, though its entrance is so narrow as to admit of only one ship at a time, can accommodate 1,000 sail. The chief exports are corn, rape, butter, cheese, meat, cattle, wool, hides, and grain-spirits; and the imports include all kinds of foreign products and manufactures. There is steam communication with every quarter of the world, and railways connect it with other parts of the island, but to gain access to the mainland it is necessary to cross the Great Belt from Korsör to Nyborg. Copenhagen was a mere fishing village until 1165, when Axel, or Absolon, Bishop of Roskilde, built his palace there. It remained the property of the episcopal see until 1443, when it was acquired by the Danish Crown.

Copepoda, an order of Crustacea (q.v.) belonging to the sub-class Entomostraca (q.v.). The characters by which they may be distinguished from allied orders are as follows:—(1) They are small but elongated in form; (2) they have four or five pairs of two-branched swimming feet (from which they derive their name, it signifying "oar-footed"); (3) the abdomen is composed of five segments; (4) the free-swimming forms are segmented, but this is lost in the degraded parasitic forms. The Copepoda live both in fresh and salt water; the best known genus is "Cyclops" (q.v.), one of the commonest and most easily recognised of all the "water fleas." *Cetochilus* is a well-known marine form, and occurs in such abundance in the colder regions of the Atlantic as to give the sea a reddish colour; it also serves as one of the main sources of the food of the whales. Many members of the order are parasitic, such as *Lernæa*, *Argulus*, etc., and these are very degenerate; their limbs are rudimentary, they have a suctorial mouth, and have usually lost their eyes and respiratory organs. Their close affinity to the other members of the class is shown by their passing through the same "Nauplius" (q.v.) stage, and as some of the males do not become parasitic they remain as normal Copepoda. In addition to the respiration carried on by the general surface of the body (cutaneous), there is also an "anal respiration," water being alternately admitted into and expelled from the rectum.

Copernicus, Nicolas (1473–1543), the inaugurator of the modern system of astronomy, was born at Thorn in Poland, now West Prussia. His father was Polish and his mother German. Educated under the auspices of his uncle, Lucas, prince-bishop of Ermland, he matriculated at Cracow University in 1491, and studied mathematics, optics, and perspective. In 1496 he became a student of the canon law at Bologna, and in 1497 was nominated to a canonry at Frauenberg, Frisches Haff. In 1500 he was lecturing on astronomy at Rome, and observed there an eclipse of the moon. In 1501 he studied medicine at Padua, and, after taking his degree as doctor in canon law, he settled in Prussia in 1505. He never took full Orders, but from 1507–1512 he occupied the post of medical attendant upon his uncle. Upon his uncle's death he became possessor of £450 a year, and devoted himself chiefly to astronomy, his time, however, being also occupied by a variety of duties. In 1523 he was administrator of the diocese, and in 1542 he was smitten by the disease that carried him off the next year. It was in 1530 that his great work *De Orbium Revolutionibus* appeared. The great feature of this was the theory that the sun was the centre of our system, and that round it the earth, as well as the other planets, revolved. In the six books of this work he endeavoured to establish ten propositions, some of them fanciful, others true, but supported by fanciful arguments. But his main point was that the sun and not the earth was the centre of the solar system, and that the earth had a motion round its axis. He was not original in this view, since as early as the Pythagoreans a similar view had been entertained. His belief in circular orbits landed him in many difficulties, and rendered necessary the imagination of a system with checks and modifications to reconcile observed facts with

expected ones. It remained for Kepler to perfect the system. Strange to say, the views of Copernicus gave no offence to Catholics, but aroused bitter opposition among Protestants, Luther and Melancthon being among his opponents.

Copland, JAMES (1791 – 1870), a Scottish physician, born at Deerness in the Orkneys. He took the degree of M.D. in Edinburgh in 1815, and in 1820 settled in London. Besides many papers in medical journals and elsewhere upon yellow fever, hydrophobia, cholera, and other medical subjects, he published in 1830 a *Dictionary of Practical Medicine*, and wrote upon palsy, apoplexy, and consumption.

Copley, JOHN SINGLETON, R.A. (1737–1815), noted as a portrait and historical painter, and also as being the father of Lord Chancellor Lyndhurst. Born at Boston, U.S., of English parents, who had emigrated from Ireland, he took lessons from his stepfather, who was a portrait painter and engraver, and showed such talent that at the age of 18 he was commissioned to paint Washington's portrait. In 1766–67 he sent works for exhibition in England, and in 1774 he set out for Europe, where he made the acquaintance of Reynolds and other painters, and was appointed to paint portraits of the king and queen. He then went to Italy for two years of study, and on his return painted the historical works upon which his fame chiefly rests. Of these perhaps the most notable are *The Death of Chatham* and *The Death of Major Pierson*, both in the National Gallery, and engraved by Bartolozzi and Heath respectively. Others of his works are *The Siege and Relief of Gibraltar*, *Surrender of Admiral de Windt*, *Charles I. Demanding the Surrender of the Five Members*, *The Signing of Strafford's Death Warrant*, and *The Assassination of Buckingham*.

Copper, a most useful and extensively distributed metal, which with its alloys has been employed in the arts even from pre-historic times. Though early weapons of pure copper have been found, its softness was a bar to its utility until the discovery of bronze, its alloy with tin, which gives its name to the Bronze age. The Greek *chalkŏs*, and the Latin *aes*, apply apparently both to the metal and the alloy; but, from being obtained from Cyprus, the former acquired the name *cyprium*, corrupted into *cuprum*, whence its symbol in Chemistry is Cu. It is a bright metal of a peculiar red colour, having an atomic weight of 63·3, a specific gravity of 8·93, and a hardness between 2·5 and 3; very malleable and ductile, in tenacity second only to iron, in electric conductivity second to silver, and fusible at a red heat. Copper expands on solidifying from fusion. Like most of its compounds, it is partially volatile, imparting a brilliant green coloration to the flame. It dissolves in hydrochloric, sulphuric, and nitric acids, liberating hydrogen, sulphur-dioxide and nitric oxide respectively, the solutions turning blue on the addition of ammonia. Traces of copper occur in all soils, in some plants, and in the blood of animals. It forms nearly 6 per cent. of turacin, the red colouring-matter of the feathers of the turaco, or West African plantain-eater; and as a mineral it occurs native and in a number of ores. Of these, the chief are the sulphides or pyrites, chalcopyrite, redruthite, erubescite, and tetrahedrite; the oxides, especially cuprite and the carbonates, malachite and azurite, which are separately described. Native copper crystallises in cubes and in octahedra, often twinned, or in extensive dendritic masses, or it is wiry or in other massive forms. In the extensive deposits south of Lake Superior, a mass of native copper 45 feet by 22 by 8, weighing over 400 tons, has been found, and large quantities also occur in Siberia and in South Australia, generally associated with copper-ores, from which it may have resulted by reduction. From its oxides or carbonates, copper is obtained by simply heating the ore with carbon and silica; but its separation from its commoner ores, the sulphides, is a more complex process of repeated roastings, ending with *poling*, or stirring with a piece of green wood to get rid of the last traces of oxide present. The alloys of copper are even more important than the pure metal. With zinc it forms *brass*, English brass containing about 70 per cent. of copper, and *Muntz's metal*, or *yellow sheathing*, from 50 to 60 per cent. With tin it forms *bronzes*, ordinary *bell-metal* containing 80 per cent. of copper, *speculum-metal* 65 per cent., and *phosphor-bronze* 85 to 95 of copper with about 2 per cent. of phosphorus, and the remainder tin. *Aluminium-bronzes* contain from 90 to 97½ per cent. copper and from 10 to 2½ per cent. aluminium. German, or nickel, silver contains about 63 per cent. of copper, with from 11 to 19 per cent. of nickel and the remainder zinc. These alloys are hard and brittle if cooled slowly; soft and malleable, if plunged when red-hot into cold water. The once important copper mines of Cornwall are now mostly exhausted, the production of copper from British mines having fallen from nearly 16,000 tons in 1860 to 3,600 in 1880, and to 900 in 1889. Swansea is the chief centre of an enormous copper-smelting industry, for which copper to a value of over 6½ million sterling was imported in 1890; 1½ million cwt., valued at 4½ million sterling, being re-exported. Of this importation, half comes from Spain, a quarter from the United States, and a quarter from Chili.

Copperas, a name commonly given to *ferrous sulphate* or *green vitriol*, $FeSO_4 + 7OH_2$. It forms green crystals, which are soluble in water but soon oxidise. It is used among other purposes in calico printing, dyeing, and the manufacture of ink.

Copper-bottomed, or COPPERED. A vessel is said to be coppered when her bottom is sheathed with thin sheets of copper to protect it, if of wood, from the ravages of worms and the accumulation of vegetation, and, if of iron or steel, from corrosion. In iron or steel vessels, in order to preclude galvanic action, wood is interposed between the fabric and the copper; and even in wooden vessels, for the same reason, all the bolts and fastenings of the hull beneath the water-line should be of copper and not of iron. Vessels thus built are said to be "copper-fastened." The first ship in the navy to be copper-bottomed was the frigate *Alarm* in 1758. By 1783 the practice had become general. Modern iron and

steel vessels, if they can be frequently docked for cleaning, are not coppered. Their bottoms are merely protected with one of the numerous preservative paints, or anti-fouling compositions. But ships that cannot, for any reason, be often docked, are still coppered, or sheathed with zinc, over wood.

Coppermine River, in N.W. Canada, E. of the Copper mountains, falls into the Arctic Ocean, after a course of 250 miles much broken by falls and rapids.

Copper Pyrites, or CHALCOPYRITE ($Cu_2SFe_2S_3$), though not containing more than 35 per cent. of copper, is, on account of its abundance, the chief commercial source of copper. It is generally massive or in minute crystals which are commonly tetrahedra of the Pyramidal system and are often twinned. It is metallic and brass-yellow, often with an iridescent or "peacock" tarnish. Its hardness is 3·5 to 4, which distinguishes it from iron-pyrites and makes it incapable of giving a spark with steel, whilst its brittleness distinguishes it from gold, as also does its comparative lightness. Its gravity is a little over 4. The darker its colour, the richer is the ore in metallic copper. When heated it decrepitates and gives fumes and sublimate of sulphur and a magnetic globule. It abounds in the Cornish mines and in most other copper-yielding regions.

Coppers, a group of butterflies of the genus *Lycæna*, the type of *Lycænidæ* (q.v.). They derive their popular name from their copper-red colour. *Polymmatus phlæas* is the commonest British species and is fairly widely distributed. The large copper *Polymmatus hippothoæ* is now extinct, though it lived till comparatively recently in the Fens.

Coprolites, from the Greek *kopros*, dung, and *lithos*, a stone, is a term generally applied in geology to isolated nodules of the fossil dung of fishes, reptiles, etc., which occur not uncommonly in the Chalk and in other formations. [PHOSPHATIC NODULES.]

Copse, a shortened form of *coppice*, both connected with Fr. *couper* (cut). It is a tract of underwood, the trees of which are checked in their main growth by pruning, and, therefore, throw out many shoots from the main stock. Some trees cannot be turned into coppice. Those which are most capable of it, and which are often so treated for useful purposes are the oak, the hazel, and the ash. The period during which they are allowed to grow depends upon the use for which the young growth is intended, and varies generally from ten to twenty-five years. Many of the hills of the Belgian Ardennes are covered with oak-coppice, the remains of the ancient forests, and cut over every few years, the bark being in much request for tanning.

Copts, the native Christian people of Egypt, partly dispersed amongst the general population, partly in separate communities, but all alike now speaking Arabic. They are the direct descendants of the early Christians, and still belong to the same monophysite sect, recognising one nature only in Christ. The head of the Coptic Church is the Patriarch of Alexandria, but many have become Uniates, that is, acknowledge the supremacy of the Pope while retaining their national rite and using the Coptic language in the church service. The missal and other liturgical books are generally printed both in Coptic and Arabic, very few of the laity and not all of the clergy being able to understand the sense of the old texts. Otherwise they are relatively well educated, hence largely employed as secretaries, notaries, correspondents, and commercial agents throughout Egypt and Nubia. The Coptic language, of which there are three varieties (Memphitic, Theban, and Basmuric), represents a later form of the old Egyptian, and is written since the Ptolemaic epoch in an alphabet based on Greek, with a few characters added from the hieroglyphics to express sounds unknown in Hellenic. The word Copt itself is a corrupt form of Egypt, that is, *Eghypt* with hard *g*. Population (1890) about 300,000.

Copyhold, a term applied to lands held by tenure of Copy of Court Roll (as the name partly denotes) and according to the custom of the manor. In the reign of Edward I. copyholders were still in the aboriginal state of villenage, cultivating the demesne lands of the lord merely as serfs, and having no certainty of tenure. In the reign of Edward III. they obtained a comparative certainty of tenure, so long as they performed the accustomed services; finally, in Edward IV.'s reign, they could maintain an action against their lord for trespass or wrongful ejection. The essentials of a copyhold tenure, according to Blackstone, are—(1) That the lands be parcel of and situate within that manor under which they are held; (2) that they have been demised or demisable by Copy of Court Roll immemorially. To the present day copyholds retain some traces of their frail original. Thus for some purposes the copyholder is still a mere tenant-at-will of his lands, the freehold therein remaining in his lord, who, therefore, is owner of all the mines and minerals under the land (though he cannot work them without the tenant's consent, except by a local custom), and also of the timber upon it; and the copyholder cannot without licence lease the lands for a longer term than one year, or commit any waste. Nevertheless, the copyholder when admitted is possessed of a quasi seizin of his lands; in other words, he is seised of them as against all the world except his lord. There may be all variety of estates in copyhold lands—for life, *pur autre vie* in tail, or in fee simple; but with reference to estate tail in copyholds there is some *distinction*, all manors not admitting this tenure. Copyholds were first made liable for the debts of the owner after his decease in 1833, and, in 1838, during his life. They are also liable, in bankruptcy, to the same extent as freeholds. They are devisable without any previous surrender to the use of the will, but if the owner dies intestate, they descend to his customary heir. Upon the death of a tenant, his lord is entitled to seize his best beast, and he is also entitled to

many other fines and perquisites on death, alienation, etc.

Enfranchisement of copyholds, voluntary and compulsory, has been provided for by several statutes. The effect of enfranchisement is that the lands become freehold, but with the saving of all commonable rights and beneficial limitations. Enfranchisement is now carried out in the office of the Land Commissioners, 3, St. James's Square, London, where scales of compensation, etc., can be obtained.

Copying, in its simple meaning, the imitation as closely as possible of a model. In painting the copy is often made to do duty for the original, which it sometimes fraudulently counterfeits. A familiar example of copying is the ordinary tracing of a map, or drawing, which is first taken on transparent paper, and then transferred by means of a carbon paper to the surface upon which it is intended finally to appear. For the rapid and indefinite multiplication of copies many processes have been devised, the most familiar of which are the ordinary copying-press, which finds its place in every office where it is desirable that copies of correspondence, or other transactions, should be preserved. In this case a special kind of ink is made to transfer the writing under heavy pressure to one or more prepared papers. Another familiar contrivance for copying, which, with slight modifications, and under many names, is largely employed, has for its principal feature the transfer of a document written with a special ink to the surface of a composition which takes a negative of the writing, and from which a multitude of copies may be taken by simply laying on successive sheets of paper one at a time and applying a gentle pressure. Printing is the most widely extended method of copying.

Copyright was defined by Lord Mansfield as "an incorporeal right to the sole printing and publishing of somewhat intellectual communicated by letters." It is a species of property founded on industrial occupancy, to wit, labour and invention bestowed on materials. The earliest instance of a recognition of copyright is to be found in the Charter of the Stationers' Company, granted by Philip and Mary, and in the Decrees of the Court of Star Chamber; and the first statute on the subject was the 8 Anne c. 19, which professes to have been passed for the encouragement and protection of learned men. This Act was repealed by the Statute 5 and 6 Vict. c. 45, which with some subsequent statutes now regulates the law of copyright. By the third section of the principal Act it is enacted that the copyright in every book which shall be published in the author's lifetime shall endure for the natural life of such author, and for the further term of seven years from his death, and shall be the property of such author and his assigns; but if the said seven years shall expire before the expiration of 42 years from the first publication of such book, then the copyright shall in that case endure for the full period of 42 years, and the copyright of every book which shall be first published after the death of its author shall endure for the term of 42 years from the first publication thereof. But the right of property in copyright must be registered in the registry of the Stationers' Company, and after such registry it is assignable by a mere entry of the transfer in the same registry in the manner prescribed by the Act. International copyright is provided for by the International Copyright Act, 1886. Proprietors of copyright in works published in this country must give notice to the Commissioners of Customs, in order to have such works inserted in the Customs of copyright works prohibited to be imported into the United Kingdom or Colonies. Copyright and Performing Right, in *musical* and *dramatic works*, depend upon the combined effect of the 3 and 4 William IV., chap. 15, and 5 and 6 Victoria, chap. 45, under which the author is entitled to the like period as in the case of literary works. The clauses as to registration and delivery of copies apply, except in the case of performing right in dramatic works. It is a moot point whether such right in unpublished dramatic works is not perpetual. A novelist has no right to protection from dramatisation unless by himself dramatising his novel before publication. In all cases of infringement of musical or dramatic copyright an injunction may be obtained from the High Court restraining the offence, and damages or an account of the profits made by the infringer. There is also a penalty of 40s. imposed for each unlawful performance of a dramatic work. As to what is "dramatic" and who is an infringer, a song about a fire at sea is dramatic; a proprietor of a theatre who let it with the scenery, properties, and company to B was held liable for unlawful performance by B. The owner of a tavern who let a room to an intending infringer was held not liable. There is copyright in new words written to a non-copyright air, and even in a new accompaniment to an old air; also in an authorised arrangement of an opera score for the piano. The Berne Convention protects not only the performing and multiplying right of an author or composer, but gives exclusive right of translation to the former for a limited period. By the new American law performing right in music is ignored.

Coquelin, Benoit Constant, a noted French actor (b. 1841). Born at Boulogne, he entered the Conservatoire in 1859, and obtained the second prize for Comedy. He appeared at the Theâtre Français in 1860 as Gros René in *Dépit Amoureux*. He played there till 1886, and then appeared in London in 1887–88, going afterwards to South America and to the United States. He has recently been playing again in London.

Coquerel, 1. Athanase Laurent (1795–1868), a pastor of the French Reformed Church. After studying theology at Montauban, he became minister of the French Church in Amsterdam. In 1830 he came to Paris, where he preached till his death. In 1848 he was elected deputy to the National Assembly for the Seine department, but after the *coup d'état* of 1851 he retired from political life. Among his theological and controversial writings, his answer to Strauss's *Life of Jesus* attracted most attention. He published many

sermons, and was a voluminous preacher and a renowned orator. 2. ATHANASE JOSÜÉ LAURENT (1820–1875), son of the above, born in Amsterdam, was also a famous minister of the same church. He wrote much, and his views were more advanced than those of his father.

Coquilla Nut, the rich brown mottled seeds of a Brazilian palm, *Attalea funifera*, which are three or four inches long, and so hard as to be turned into handles for umbrellas and doors, buttons, etc. The supply is declining.

Coquimbo, capital of a Chilian province, is built upon three levels or terraces. It is a fine town, and well built. The port of Coquimbo is situated upon a bay six miles S.W. The chief articles of export are cobalt, copper, manganese, silver, and some cattle and hay. The province, stretching from the shore to the Andes, contains 12,855 square miles. There is some farming in the south, and there is mining of copper, silver, and gold.

Cora, a Mexican people whose language is still current in the state of Jalisco. It is a member of Buschmann's Aztec-Sonora group, though its relations to Aztec are rather phonetical than structural; there are three varieties, Ateakari, Muntzicat, and Teakualitzigti. Type strikingly Mongolic, high cheek bones, oblique eyes, dull yellow complexion, flat features, and in habits resembling some Siberian peoples. The Coras and their Tepehuan neighbours plait their long horse-tail hair in a single tress which falls down the back. All are now settled and Christians, gradually merging in the surrounding Spanish-speaking populations.

Coracias. [ROLLER.]

Coracle, a word derived from the Keltic, denotes a kind of canoe or light boat consisting of a frame more or less elaborate, generally of wickerwork covered by a hide, or several hides in case of the larger examples. The boat is so light that its occupant, on reaching land, can easily carry it away. The vessel is generally constructed to carry one person, but a second person is sometimes taken, who kneels behind the paddler, placing his hands upon the latter's shoulders. The vessel is of great antiquity, and is even now in use in the Wye and Severn, and on some parts of the Irish coast. The canoe of the Red Indian is not unlike it, save that it is longer in proportion to the width, and that bark takes the place of hide.

Coracoid, one of two bones forming on each side the ventral portion of the pectoral arch in bony fishes, amphibia, most reptiles, and having their greatest development in birds and monotremes. They are absent in snakes, and in most mammals are reduced to a process of the scapula, which in man is somewhat like the beak of a crow, whence the name.

Coracomorphæ, in Huxley's classification a group of birds, equivalent to the older group Passeres. [PASSERINE BIRDS.]

Corais, or CORAY, ADAMANTIOS (1748–1833), a Greek scholar born at Smyrna. His grandfather promised his library to that one of his grandsons who should make the most progress in the study of ancient Greek, and this turned the youth's attention to the subject. Following at first his father's steps as a merchant, he finally abandoned this calling for literature, and settled in Paris. He translated Greek authors, and did much to advance Greek studies and the cause of Greek freedom. He produced a work on Modern Greek Literature, and many papers on kindred subjects, also an Autobiography.

Coral is the skeleton or shell of various members of the great phylum, the "Cœlenterata" (q.v.). A sea anemone is a good example of one of this group which has no hard parts; but in many animals very closely allied to the anemones, the animal is protected by an external coat of hard calcareous matter, which is strengthened by a number of plates radiating from the centre and alternating with the mesenteries. Such is an ordinary simple coral, such as *Caryocyathus smithi* which lives on the Devonshire coast. The majority of existing corals are not simple but colonial, living in great reefs formed by large numbers of corallites (q.v.), each one of which is based on the plan of a simple coral. Such are the large branching Madrepores or the massive Astrean corals. As popularly used the term includes practically all the calcareous skeletons of the Cœlenterata; thus it includes among the Hydrozoa (q.v.), the massive or foliaceous expansions of *Millepora* (q.v.), and the dendroid branching Stylasters. In these the coral consists of the skeleton formed by a colony of individuals each based on the type of a Hydra (q.v.). Usually each colony consists of a double set of zooids, viz. a central "gastrozooid" surrounded by a ring of comparatively rudimentary "dactylozooids," the whole in Stylaster forming a "cyclosystem." As in Hydra the body cavity is not divided into chambers by mesenteries, there are no "septa" in the corals of this group (Hydrocorallineæ). The remaining corals belong to the class Anthozoa (q.v.), and typically all contain septa; this class contains two groups, the Alcyonaria (q.v.) and the Zoantharia (q.v.), each of which contains a series of corals. In the "Dead Men's Fingers" (*Alcyonium*) of our coasts the skeletal structures consist simply of a number of isolated spicules; but in other cases these spicules have fused into a solid mass, which forms a central axis, as in the "Red Coral" (*Corallium rubrum*), or a series of tubes united by occasional transverse layers or platforms, as in the "Organ-pipe Coral" (*Tubipora musica*). In other Alcyonaria the skeleton is of a two-fold origin; in addition to the spicules there is a central axial skeleton developed by an invagination of the base of the external layer (ectodermis); such is Gorgonia or the "Fan Corals," in which the axial sclerobasic skeleton supports the soft tissues by which it is surrounded, and in which are embedded the spicules. The "Blue Coral" (*Heliopora*) also belongs to the Alcyonaria; its skeleton is composed of tubes of two sizes: the larger (or autopores) are occupied by the sexual

zooids, the smaller (siphonopores) by the reduced, sexless zooids ; the tubes are crossed by horizontal layers or tabulæ, and are strengthened by radial plates similar to the septa of the true corals ; as these, however, do not correspond in number to the mesenteries they are known as "pseudo-septa." The extinct family, the *Heliolitidæ*, members of which were abundant in Palæozoic times, was a close ally of *Heliopora*. The well-known *Halysites catenularis*, or the " Dudley Chain Coral," from the Silurian rocks of Dudley, and the less known *Chætetidæ* and *Auloporidæ*, both also Palæozoic, are also probably Alcyonarian corals.

The Zoantharia include most of the true corals, but even here the family of Black Corals (*Antipatharia*) must be excluded, as they have horny sclerobasic skeletons, and may be compared to the Gorgonias with the zooids of a six-rayed instead of an eight-rayed Alcyonarian type. The Zoantharia includes the Madreporaria or the true corals. *Caryophyllia* may be taken as a good type of these ; it consists of a series of radial vertical plates or septa, which are either six or some multiple of six in number. Externally these septa expand out and unite together so as to form a closed external wall or " theca ;" this is often strengthened by an epitheca deposited as a superficial crust around the coral. The axis is usually filled up by a pillar known as the " columella " but this may be absent ; the columella often ends above as a knob-shaped expansion supporting the main mass of the soft parts of the coral polype, which lives in the cup-shaped depression (or " calice ") at the upper side. Between the columella and the ends of the septa are often one or more circles or " crowns " of plate-like structures known as " pali." The septa may extend out beyond the side wall of the coral and form a series of longitudinal ridges known as costæ : both costæ and septa usually bear numerous outgrowths, forming either slight teeth or ridges, or long spine-like processes (synapticulæ), or flat plates running obliquely through the interseptal chambers (dissepiments), or similar plates placed horizontally and continuous right across the coral (tabulæ).

These are the main structures in a simple coral. But two of the three methods of coral reproduction give rise to colonies. The first method is by ovæ which may be carried away and grow into independent simple corals like the parent ; the second, by budding or gemmation, giving rise typically to a dendroid colony ; and, third, by fission, one coral splitting across into two and giving rise to massive forms. The whole colony may be formed simply of young corallites, or these may be embedded in an intermediate tissue—the cœnenchyma.

The classification of the true corals is given under " Madreporaria." The corals have a somewhat restricted range both in space and depth : the reef corals are limited to a mean temperature of not below 68° F., and thus occur only in tropical seas and at a depth of rarely below 15 to 30 fathoms. They are usually very sensitive to impurities in the water, and exposure to air and brackish water is fatal ; exceptions to these, however, occur. Thus a *Madrepora* lives in New Zealand in a river that is only very slightly brackish. The simple corals have a much wider range ; a few species occur on the British coasts, and some have been dredged from depths of over 1,000 fathoms.

Coral Fishes. [CHÆTODON.]

Coral Islands. Scattered over a vast elliptical area of the Central Pacific measuring some 9,000 miles in extreme length by about 4,500 miles in width, there are a series of archipelagoes consisting of numerous small, low, ring-shaped islands, or atolls. Chamisso, a German poet and naturalist, first explained how the annular form could have been produced by the greater growth of the corals on the outside of the reef where food and air were more abundant: hence the outside would grow upward while the coral in the middle would languish and die. But this theory, though adequate for atolls in shallow seas, such as those of the Persian Gulf, or parts of the West Indies, would not account for cases where the central lagoon is deeper than the zone of coral growth. Hence to explain these deep lagoons the theory of the growth of the atolls on the rims of volcanic craters was proposed. But the form and size of the islands were quite fatal to this view, as no craters were known of such vast dimensions or remarkable shapes. Moreover the existence of groups of volcanoes, all rising to within a couple of hundred feet of the surface and none rising above it, was highly improbable. Darwin pointed out that coral reefs may be divided into three classes :(1) fringing reefs occurring in shallow water and closely skirting a shore line. (2) Barrier reefs, formed at some distance from the shore and separated from it by a broad and often deep channel: such reefs may either encircle an island or group of islands, or run for hundreds of miles at some distance from a continental shore. (3) The true oceanic atolls, ring-shaped reefs, enclosing a lagoon with or without islands in it. Darwin's theory was that the reefs were first formed always on shallow shores as fringing reefs ; then during a period of subsidence the reefs were carried downward, the coral polypes building upward to keep within the zone of coral growth ; this would usually only be possible to the outer portion of the reefs : for the corals there would take all the food and oxygen in the water, while those nearer shore would be further handicapped by occasional floods of mud and water. Hence the outer parts of the reefs would grow upward and keep pace with the subsidence, and become separated from the receding shore by a lagoon channel ; they would thus pass to the form of barrier reefs. By a continuation of this process the islands would decrease in size, and the reefs contract into a ring broken only by channels on the leeward side. By a still further continuation of the subsidence the islands would all disappear and nothing but a simple atoll remain. This theory was so simple and complete that it gained almost universal acceptance for many years, and it was not till 1863 that serious doubt was thrown upon it by the work of Semper. Since then several authors, Rein, L. Agassiz, and others, have adduced cases of atolls in various shallow seas for which the subsidence theory was not required. But Darwin

had already pointed out similar cases and that his theory was not intended to apply to them. The most important criticism was that of Dr. J. Murray of the *Challenger* Expedition, whose theory is the only one that seriously disputes the field with that of Darwin. This newer theory is based on the fact that all over the tropical seas skeletons of the organisms that live on the surface fall as a perpetual hail to the bottom; where the shells fall on submerged peaks they would in time, aided by the molluscs, deep-sea corals, etc., raise these to the zone of reef-coral growth. The ring-shaped form of the atolls would then be due (1) to the greater growth of the corals on the outside, (2) to the reefs spreading seaward on a talus of coral rock, and (3) to the removal of the inner limestone by solution: the last factor would also form lagoon channels. Dr. Murray points out in favour of his theory that so far as is known the rocks on which coral reefs have been built are always volcanic. Great stress is also laid on the asserted absence of any reefs of the thickness that must result from the subsidence method of formation. Hence it is claimed that the new theory accounts for all the facts and therefore ought to be accepted as it does not involve so many important postulates as Darwin's theory does. Speaking generally, Dr. Murray's theory has been somewhat widely accepted by zoologists but rejected by geologists, Sir A. Geikie being the principal exception among the latter. The geologists urge in objection to the new theory that the formation and deepening of lagoons by solution will not work, as no such action is seen in places that would be most favourable to it, and that the lagoons really tend to silt up. But the principal objection to it is that it leaves unexplained many facts that seem to afford evidence for the subsidence theory: thus it is claimed that there are coral reefs very much thicker than any that could be formed without subsidence, as in the case of the Dolomite Reefs of Tyrol. Direct evidence of subsidence is afforded (1) by the existence of reefs and reef rocks at a greater depth than the lower limit of coral growth; (2) by borings on the Sandwich Islands, near Honolulu, which have proved the existence of masses of coral rock 500 feet in thickness at a depth of over 1,000 feet below the sea level; (3) the existence of lagoons and channels more than thirty fathoms deep. Indirect evidence for submergence is also given by the irregular forms of many coral-girt islands such as the Marquesas, where the "spiderleg-like ridges" and fiords between them are proof of subaerial erosion when the land was at a higher level than at present. The distribution of coral islands is also of much importance in this connection. Dana has pointed out that stationary reefs have broad reef grounds and are well wooded, while islands that are rapidly subsiding become smaller, are low, bare, and often tide-washed. The Pacific Archipelagoes generally have a central group or line of islands having the characters of stationary reefs, while in travelling away from these the atolls become smaller and smaller until they disappear in an area of especially deep sea; on the other side of such a line of depression the reefs reappear as small shoals and tide-washed atolls, and grow to larger and wooded islands as they approach a line of rest or elevation.

As many important conclusions rest on the theory of the formation of coral reefs, it is not surprising that it has occupied so much attention during the last few years. The few borings that have been made have done much to re-establish Darwin's theory with the limitations that he himself placed on it; but the question will probably not be finally settled until a considerable series of borings in atolls have been made. But the cost and the mechanical difficulties involved in such borings will probably long delay the application of this final test.

Coral Neck, a dealers' name for *Amadina fasciata*, sometimes called the Cut-throat Finch. A red band extends across the throat of the male, whence the popular names.

Coral Rag, or CORALLIAN stage, so named from the abundance of its fossil corals, is one of the most distinctive subdivisions of the Jurassic system, being traceable from the Mediterranean to Normandy and right across England from Weymouth to Filey. It varies much in thickness, occurring, in fact, in lenticular masses, and consists in England of rubbly limestone, true coral-reefs, grits, and clays, and of massive limestones in Switzerland, Germany, and France. In addition to such corals as *Thecosmilia*, *Thamnastræa*, and *Isastræa*, the most characteristic fossil is the urchin *Cidaris florigemma*. Oolitic limonite (hydrous oxide of iron) is worked in the Corallian at Abbotsbury, near Weymouth; and at Headington, near Oxford, a limestone in the series is much quarried for building.

Coral Snake, a loose popular name for some South American snakes marked with black, red, and yellow rings, a coloration found only in the serpents of this region. The name is often confined to the genus Elaps, and sometimes to *E. corallinus*. All the family Elapidæ are venomous, but in the species of Elaps the mouth is too small for the bite to be very dangerous. The coloration of this genus is simulated by some of the Tortricidæ, which are quite harmless.

Coralline Crag, a series of sands containing numerous calcareous fossils, especially Polyzoa, and having a thickness of from 40 to 60 feet, which form the base of the Pliocene series in Suffolk. It is also known as the Suffolk, White, or Bryozoan Crag, as it resembles chalk in appearance, and the prevailing group of fossils in it are not corallines (q.v.), but Polyzoa or, as they are sometimes called, Bryozoa. At the base of the series is the Suffolk bone-bed, from six inches to three feet thick, containing phosphatic nodules and water-worn teeth and bones of *Mastodon*, *Rhinoceros*, tapir, bear, whales, and sharks, together with rounded sandstone concretions, called "box-stones." The Coralline Crag is believed to have been deposited in a sea not more than 300 feet deep. It has yielded 140 species of Polyzoa; and of the Mollusca

84 per cent. are living species, and 5 per cent. are northern types.

Corallines, or NULLIPORES, the family *Corallinaceæ* among the Florideæ or Red Algæ, are distinguished by being thickly incrusted with carbonate of lime, which gives them considerable likeness to true coral. Their reproductive structures, both sexual and asexual, are in conceptacles sunk in the thallus, but with an opening to the surface at their apex. The chief genera are *Corallina* and *Melobesia*, and, though more abundant in warmer seas, they are represented on our coasts. Corallines to some extent protect rocks from denudation, and their remains, ground down by waves and blown by wind, form the "calcareous sand" of the Bahamas and Bermuda, which is in places cemented by percolating land-springs into a compact limestone.

Corallite, an individual member of a compound coral: thus an ordinary reef coral is composed of a large number of corallites.

Corallium is the name of the genus of which the ordinary "Red Coral" is the best known representative. It belongs to the class Alcyonaria (q.v.) and so is not a typical coral, the body being arranged on an eight-radial instead of a six-radial type; the eight tentacles moreover are all pinnate. The "red coral" itself is composed of a series of small spicules fused together into a solid calcareous axis; as this is deposited by the soft tissues by which it is surrounded, it is known as a "sclerobasic" skeleton. The individual zooids that form the colony occur embedded in a fleshy layer (the cœnosarc) which surrounds the skeleton. The best known species is *Corallium rubrum*, which lives abundantly in the shallower waters of the Mediterranean. The genus was first represented in Jurassic times.

Corallum, an entire solitary coral, used in contradistinction to corallite.

Coram, THOMAS (1667–1751), an English philanthropist, and the founder of the Foundling Hospital. He was born at Lyme Regis, and became a sailor, rising to the position of merchant captain. In 1694 he was settled at Taunton, Massachusetts, carrying on the pursuit of farmer and boat-builder. He again went to sea, and finally came to London. He took great interest in the settlement of Georgia, and was instrumental in settling English artisans in Nova Scotia. His sympathy with the sufferings of the poor in London led him to establish the Foundling Hospital in 1740, a work in which he had the sympathies of Hogarth. His works of charity impoverished him, and in his old age he was dependent upon a small annuity raised for him by the subscriptions of appreciating friends.

Corato, a town situate in a fertile plain of South Italy, twenty-five miles W. of Bari.

Corban, a Hebrew word denoting an offering to God, or something set apart for His service. The word might denote a vow to perform some specific act, or some object set apart to pious uses. Christ in the Gospel reproaches the Pharisees for refusing their means to legitimate purposes on the ground of their being *corban*, and so dedicated to God. *Corbana* denoted the church treasury, and in the Coptic Liturgy the name *corban* was applied to the Host.

Corbel, from the French, literally *a little basket*, is an architectural term denoting a projection from a wall destined for the support of a pillar, a beam, or the like. The earlier forms of corbel were decorated only in front, having plain sides, but later examples show much decoration.

Corbet, RICHARD (1582–1635), an English bishop and poet, the son of a gardener living at Ewell, Surrey. Educated at Westminster School and at Oxford, he became Dean of Christ Church in 1620, Bishop of Oxford in 1624, and Bishop of Norwich in 1632. His chief poems were *Iter Boreale*, an account of a student's tour, and *The Fairies' Farewell*.

Corbie Steps, a corrupted form of corbel steps, are the steps in which the slope of a gable is sometimes built to avoid the monotony of a plain slope. This method of decoration is a common feature of Netherland architecture, and may be seen, at Antwerp among other places, both upon old and new buildings. Some of the colleges of Oxford also present instances of it.

Cordage is the generic term for the running rigging of a ship, and for the reserves intended to replace it. "Cable-laid" cordage is made with nine strands. Three strands are "laid" slack; and three of the resultant ropes, "closed together," make a cable or cablet. "Stroud-laid" and "hawser-laid" are other varieties.

Corday, D'ARMANS, MARIE CHARLOTTE (1768–1793), the "Angel of Assassination" of Lamartine. She was born at St. Saturnin of a noble family, having Corneille's blood in her veins. During a solitary childhood her sympathies with mankind were fostered by the reading of Voltaire's works, while a study of Plutarch filled her with old-world ideas of patriotic devotion. Although in favour of the Revolution she hated the excesses of the Jacobins, and went to Paris with the intention of avenging the wrongs of the Girondins, by slaying either Robespierre or Marat. After some difficulty she gained access to Marat with a pretended mission from Caen, and stabbed him as he sat in his bath. Brought before the tribunal she gloried in her deed, and scouted the defence of insanity set up by her counsel. A picture painted of her in the interval between her sentence and its execution is now at Versailles. She met death bravely, and it was said that her severed head blushed when struck by the executioner.

Cordeliers, monks of the Franciscan order, so called from the cord girdle which forms part of their special costume. The name was also borne by the members of a Parisian club formed in 1792, of which Danton, Marat, Camille Desmoulins, and Hebert were members. It had considerable

renown, and for a time even rivalled the famous Jacobin club.

Cordilleras (from Spanish *chain* or *ridge*) is a word used in America, especially in South America, to denote the various chains of mountains. Thus in North America the Rocky Mountains are Cordilleras, in South America the Andes, and in Central the Cordilleras proper extend from Darien to North Mexico, rising from the Isthmus of Panama to the high plateaux of Mexico, which are 17,000 ft. and upwards in height.

Cordite, a propulsive explosive, recommended by Sir Frederick Abel's Committee in 1889, and since then practically adopted as the smokeless explosive of the British services. It takes its name from its external resemblance to pieces of cord, or, more exactly, pieces of cat-gut. Its exact composition is secret; but it is akin to celluloid, and its basis is nitro-cotton. One pound of it, used as charge for a gun, gives a greater initial velocity to the projectile than is given by 3 lbs. of any of the older powders. The amount of smoke is so small as to be almost nil; the report is, however, intensified rather than lessened.

Cordoba. 1. A town in the Argentine Republic, capital of the province of Cordoba, which contains 55,000 square miles, chiefly pampas, where cattle are largely reared, the chief exports being hides and wool. The town is on the river Primero, 246 miles from Rosario, and consists for the most part of straight streets at right angles, with brick sidewalks. There is a fine cathedral of St. Peter, a good city hall, and a university. Formerly it was a great centre of Jesuit learning and education. The town is developing rapidly, and has tramways and railways. 2. A Mexican town in the province of Vera Cruz, from which it is distant about 60 miles south-west. It is surrounded by coffee plantations, and its chief trade is in coffee, cotton, sugar, and tobacco. There are many remains of the ancient Mexican civilisation in the neighbourhood.

Cordon Bleu, a dealers' name for *Estrelda phœnicotis*, the crimson-eared waxbill, a beautiful but delicate cage-bird. [WAXBILL.]

Cordon Bleu, or BLUE RIBBON, formerly marked the Bourbon order of the Holy Ghost. It has since come to signify high excellence as a cook (but only with reference to females), because, as some say, a medal with blue ribbon was bestowed on such; as others say, a kind of joke upon the order above mentioned. Another reason, and probably a more correct one, for a good cook being called a cordon bleu is that the order being the most distinguished, *Cordon bleu* came to be synonymous with high excellence in any department. Thus it is usual in the racing world to speak of winning the Derby as the blue ribbon of the turf.

Cordova (Lat. *Corduba*), a Spanish city, capital of the province Cordova in Andalusia, on the right bank of the Guadalquivir, at the foot of the Sierra de Cordova, and about 80 miles south-east of Seville. It is surrounded by walls, of Moorish origin, built upon Roman foundations. The streets are narrow and crooked, and the houses are much decayed, but are often surrounded by large gardens. A bridge of 16 arches leads to the southern suburb. The cathedral, formerly a mosque, is a splendid specimen of Moorish architecture, but has been spoilt by additions which were made to render its appearance more ecclesiastical. Its one great feature is a courtyard of columns. There is a ruined Moorish palace—the Alcazar. In Moorish times Cordova was noted for its silversmiths, and for its leather which has given us the word *cordwainer*. Flax, linen, silk, and woollens are its chief productions. Once a Carthaginian settlement, it became the first Roman colony in Spain. Later it was the capital of Moorish Spain, was taken by Ferdinand in 1236, and was stormed and pillaged by the French in 1808.

Cordylophora is a very convenient type of the compound Hydroid Zoophytes, as it lives in fresh or brackish water and is common in English canals and docks, where it usually occurs attached to floating timber. It consists of a branched plant-like colony composed of two elements, the trophosome and the gonosome: the latter is the reproductive portion of the colony, and consists of a number of blunt, egg-shaped sacs (gonophores) borne at the base of the terminal branches. The trophosome is the main part of the colony, and consists of the long-branched stem (or hydrocaulus) and of the polypes (or hydranths) at the ends of the branches. The whole stem is covered by a thin membrane known as the perisarc, which extends over the gonophores but not over the polypes. *Cordylophora* reproduces by the formation of eggs on the central axis of the gonophore, which develop into free-swimming larvæ known as "planulæ" (q.v.); these become fixed by one end and grow into the adult form. The development is, therefore, said to be direct, as there is no "medusa" or jelly-fish stage as occurs in many of the Hydroids. Cordylophora was once a marine and estuarine form, and has only spread into fresh water during the present century.

Core, in *Engineering*, is a term employed generally to signify the interior part of a hollow body. Hollows in castings are produced by the use of cores placed in the mould. The central portion of a wall is termed its core. An electro-magnet consists of a series of convolutions of wire round a central core.

Corea, a peninsula to the south of China, between the Yellow Sea and the Sea of Japan, in lat. 34° to 42° 25′ N., and long. 124° 35′ to 130° 50′ E., containing over 79,000 square miles. On the E. coast, which is comparatively regular, there is a large gulf—Broughton Bay—and there are several other bays and harbours, the chief being Lazaref, Pingei, and Chosan harbour. The W. coast is much indented. The country is very mountainous, and has been likened to the "sea under a gale." A range runs from N. to S., near the coast, and sends out spurs to the W. and S.W., and rises to a height of 8,000 feet. The rivers are numerous, the

principal being Ya-lu-Kiang on the E., the Mi-Kiang on the W., the Tai-Tang-Kang, and the Han-Kang, on which is the capital, Seoul. On the S. the Nak-Tong-Kang flows into Chosan harbour. The climate has a great range of temperature, and is humid. The chief vegetable productions are rice, wheat, millet, rye, cotton, hemp, and ginsengs, and the fruits of mid-Europe. Among the animals are tigers, bears, boars, cattle, a small breed of horses, swine, and dogs. Only the king may rear sheep and goats for sacrifice. There are eight provinces, and many towns, the capital Seoul being walled. The king, though the vassal of China, is absolute in his own land. The government is carried on by three ministers, who are aided by six judges, and each province has its governor. The nobles have almost a monopoly of government posts. The language is Turanian, but Chinese is extensively used. Education is general, and as in China, examination is the test for almost every employment. There are traces of ancient cults, such as serpent-worship, and the perpetual keeping up of the hearth-fire. As in China, much reverence is paid to ancestors, and family love between father and son is strong. Women occupy an inferior and insignificant position. The pursuits are chiefly agricultural, there being hardly any manufacture, save that of paper. Till lately there was next to no commerce or dealing with foreigners, and hardly any coinage, barter, especially in the N., being resorted to. The Japanese were the first to secure trading rights in 1876. From 1880–86 the rights were extended to China, the United States, Germany, Great Britain, Italy, Russia, and France.

The inhabitants of Corea are usually classed with the Mongolic family, but are somewhat taller, fairer, and perhaps more robust than the average Mongol. As amongst the neighbouring Manchus, light eyes (greenish, grey, or even blue) are not uncommon, which seems to point at an early fusion of Caucasic and Mongolic elements in North-east Asia. The national records speak of two primitive races, the Sien-pi and San-San, gradually merged in the present Kao-li or Kao-ri (Coréa). Ernst Oppert (*Reisen Nach Korea*, Leipzig, 1881) everywhere met people, and especially children, with such regular features, florid complexion, light hair, and blue eyes, that they were scarcely to be distinguished from Europeans. Socially there are three distinct classes—the nobles, the common folk, and the slaves, presenting certain analogies to the caste system of India, and distinguished by their dress and speech. The hat with its enormous brim is the most striking part of the national costume. Corean culture is essentially Chinese, and Buddhism, introduced from China in 384 A.D., is at least nominally the religion of the masses. But the religious sentiment is but slightly developed, and the people may often be seen kicking their idols about for amusement or perhaps revenge. There are numerous Roman Catholic communities, French missionaries having long been labouring in this field, and an Anglican bishop has recently been appointed. In some parts the curious custom prevails of burying the dead only in the spring and autumn, those dying in the "off-seasons" being temporarily deposited in a hut raised on piles. Except in the towns, where one-storeyed brick houses with straw thatching may be seen, the Corean habitations are wretched wooden structures with mud floors and oil-paper windows. The language is polysyllabic, of a Mongolo-Tatar type, but otherwise quite distinct and betraying only some slight analogies with Japanese. W. G. Aston (*A Comparative Study of Japanese and Corean*, in the *Journal* of the Royal Asiatic Society, 1879) thinks it may be as remotely allied to Japanese as English is to Sanscrit. It is written with a peculiar alphabet of uncertain origin. But the Chinese system is also current, and Chinese itself is the language of diplomacy and, to a large extent, of the upper circles.

Coregonus, a genus of *Salmonidæ*, with about forty species, from the northern parts of temperate Europe, Asia, and N. America. The body is compressed and covered with scales of moderate size; the teeth are very small or absent; the dorsal fin is small and the caudal deeply forked. Most of them are found in lakes and rivers, and a few descend to the sea like salmon. The American species are known as white-fish. *C. clupeoides*, *C. vandesius*, and *C. pollan*, occur in the United Kingdom.

Corelli, ARCANGELO, called "il divino" (1653–1713), an Italian musical composer, born at Fusignano, and taught by Bassano. He went to Paris and Germany as a violinist, spending nine years at Munich, and then to Rome, where he settled, and was patronised by Cardinal Ottoboni, under whose auspices he gave noted Monday concerts. His concertos, sonatas, and violin pieces marked an epoch in music, and had great influence on Bach and other composers. Herr Joachim has edited an edition of his sonatas.

Corfe Castle, a village in the Isle of Purbeck, in Dorsetshire, 4 miles S.E. of Wareham. The castle is noted as the scene of the murder of Edward the Martyr (979) by his stepmother Elfrida, and the slaughter by King John of twenty knights. In 1643 Lady Bankes held it against a six weeks' siege by 600 Parliamentarians. It was afterwards dismantled, and its ruins now cover $3\frac{1}{2}$ acres.

Corfu, the CORCYRA or DREPANE of ancient days, the most northerly and the largest of the Ionian islands, separated from Albania by a channel varying in width from 2 to 12 miles. It has an area of 270 square miles. The climate is moderately good, the winters being rainy, and the summers hot and dry. The island is well-wooded, with the olive, cypress, and ilex, and the chief productions are olives, oranges, citrons, figs, honey, silk, and wine, and some maize. Goats are plentiful, and much oil is exported. The chief minerals are sulphur, salt, coal, and marble. Corfu, on the E. coast, has a good harbour and frequent steam communication. It is the seat of a Greek archbishopric and a Catholic bishopric, and there is a palace and an Ionian academy. In 734 B.C.

the Corinthians founded a colony, and the first recorded sea-fight (in 665) was between the colony and the mother country. The Romans took it in 229 B.C. In the Middle Ages it passed through many vicissitudes, and finally became Venetian. From 1815–64 it was under the protection of Great Britain, who made it over to the newly-founded Greek kingdom.

Coriander, a monotypic genus of umbelliferous plants native to Southern Europe, but occurring in cultivation and as an escape in England. It has a branching annual stem, twelve to eighteen inches high, pinnately cut leaves, and small compound umbels. The fruit, erroneously called a seed, is globular, and contains an aromatic carminative oil. These fruits are used in sugar-plums, curries, etc.

Corigliano, an Italian town in the province of Calabria Citeriore, on a river of the same name, 4 miles from the coast, on a steep hill with an ancient capital at the top. At the foot of the hill are groves of oranges and lemons. Vines also and corn are grown. The chief exports are liquorice and timber.

Corinna, a Greek poetess of Bœotia, contemporary with Pindar, whose friend and rival she is said to have been. She advised him to treat the Greek myths, and is said to have rebuked him for making too large a use of them. She was patriotic and used the Bœotian dialect, and reproached Pindar for departing from it.

Corinth, a noted city of antiquity at the S. end of the rocky Isthmus of Corinth, which rises to a height of 262 feet, and culminates in the stronghold Acrocorinthus. It possessed three harbours, Lechæum W., on the Gulf of Corinth, Cenchræ and Schænus E., on the Saronic Gulf. It was the great emporium of Greek trade, and like many other centres of material wealth was deficient in native learning and art, though the acknowledged mistress of luxury and vice. Goods were easily borne across the Isthmus from one harbour to the other, and so the city was the connecting link between east and west. One of its chief exports was the works of art which it could not produce. It possessed many colonies, and the first naval battle was between Corinth and Corcyra. Founded—so says tradition—in 1350 B.C., by Sisyphus, it became Dorian in 1074. Then succeeded an oligarchy, which was overthrown by Cypselus, who was succeeded by Periander. In 582 it again became Dorian, and was the great foe of Athens. It then became Macedonian, and afterwards joined the Achæan League. In 146 it fell into the hands of the Romans. Julius Cæsar rebuilt the city which had been destroyed, and it again became the "Star of Greece," and the home of luxury and wickedness sharply lashed by St. Paul. In the third century A.D. it fell a prey to the Goths, to Alaric in the fourth, and to the Slavs in the eighth. In 1205 it fell to the Franks, then to the Eastern Emperor, and in 1459 to the Turks, under whose rule it surely decayed. In 1822 the Turks lost it. In 1858 it was destroyed by an earthquake, and a new city was built three miles to the E. The isthmus in ancient times was crossed by a kind of ship railway, the Diolkos; afterwards a canal was undertaken. A ship canal across has long been under construction, but the works have often been interrupted. In old times Corinth was a special home of the cult of Aphrodite and of Love. Among its greatest men were Arion, Periander, and Timoleon.

Corinthians, EPISTLES TO THE, the name given to two epistles written by St. Paul to the church at Corinth, between the years 53 and 54 A.D. The first had for its object to rebuke some divisions and abuses that had arisen, and to answer certain specific questions, and was written from Ephesus; the second, written from Macedonia, rebuked further abuses, asserted the authority of St. Paul over the newly-formed church, and also urged the claim of the mother church at Jerusalem to the good offices of the faithful at Corinth. The epistles are valuable both as emphasising the peculiar temptations and failings that marked the early Christians in a cultivated and prosperous pagan city, and as setting forth the mode of dealing with them by him who was the special apostle of the Gentiles.

Coriolanus, CAIUS MARCIUS (fifth century B.C.), said to be descended from King Ancus Marcius. His mother was Volumnia, or, as some say, Veturia. He was a renowned warrior, and his exploits in the taking of Corioli gave him his name. He was an aristocrat of the aristocrats, and despised the common people, and was banished for proposing that the people, when starving, should receive none of a present of corn which had arrived from Sicily unless they gave up their tribunes. He went to the Volscians, and being put in command of their army, advanced upon Rome. His demands for the Volscians were that they should receive public land and be admitted to the privileges of Roman citizens. Overcome by the prayers of his mother, his wife, and the matrons of Rome, he forewent his intentions, and turned back, to lose his life at Volsci. Plutarch and Shakespeare have made us familiar with his name and life.

Cork. 1. A county in the province of Munster, the largest and most southerly of the counties of Ireland—110 miles long by 70 broad, and containing 2,890 square miles. The county is hilly and much diversified, being in the W. rocky and mountainous, wild and boggy, and in the S. and E. rich, fertile, and picturesque. The 250 miles of coast are bold and rocky. There are many bays, running from three to twenty-five miles inland, from Bantry Bay to Youghal harbour, the best-known being Cork harbour. Of the islands in the county, Cape Clear is the chief. The mountains run chiefly E. and W., and divide it into three principal river basins—the Blackwater, the Lee, and the Bandon. There are also many lakes. The Munster coal-field occupies the N.W., and coal, iron, copper, and marble are the chief minerals. The climate is moist, but genial, and the county is

noted for its dairy produce. The cattle are small, but yield abundance of milk. The chief trade is in leather, tweed, whiskey, malt liquor, and, above all, in provisions. Cork sends seven members to Parliament.

2. The capital of the county Cork, and forming a county in itself on the Lee, eleven miles above the mouth, and 166 miles from Dublin, is partly on a group of islands forming a swamp, and partly on the banks of the river, which is crossed by a bridge. The houses, which are for the most part of old red sandstone, present a striking appearance. There is a park of 400 acres, and an elm-shaded promenade called the Mardyke, and a good cemetery. The unevenness of the land, with here and there overhanging heights, makes Cork a fine city. The church of St. Anne, Shandon, has a tower 170 feet high. The Protestant cathedral, the Bishop's palace, the Queen's College, and the Science and Art Academy are among the most striking buildings. The harbour is ten square miles in extent, and its four quays admit vessels of 2,000 tons. Seven lines of steamers visit the harbour, which is entered by a channel two miles long and one wide, and contains several large islands. It is protected by batteries, and at Spike Island there is a torpedo defence and powerful submarine batteries. Passage and Queenstown are well known as places of call for mail steamers and ships awaiting orders. The principal manufactures are leather, iron, friezes, gloves, flour, malt liquors, and whiskey, and the exports provisiens, leather, tweeds, and live stock. The suburbs abound in villas. Cork sends two members to Parliament. An abbey was founded here by St. Finbar in 600. The Danes walled the city in the ninth century, and in 1172 King Dermot McCarthy surrendered it to Henry I. It was taken by Cromwell in 1649, and by Marlborough in 1690. James II. landed here in 1688. Here William Penn became a Quaker, and a statue commemorates the labours of Father Mathew.

Cork, the periderm, secondary cortex or outer-bark of dicotyledonous perennials. It consists of layers of muriform parenchyma, or brick-shaped cells, filled with air, the walls of which have undergone the molecular change known as cuticularisation or suberisation. This consists in the conversion of the permeable cellulose into the highly elastic impermeable *cutin*, which turns yellow with iodine or acid, and resists the action of the latter even when concentrated. The formation of cork, which is practically confined to the axis, begins at certain points beneath the epidermis of young green shoots, known as *lenticels*, where it ruptures the epidermis. It then extends throughout a layer known as the *phellogen* or *cork cambium*, the cells of which on dividing give rise to an inner layer of chlorophyll-containing cells, the *phelloderm*, and externally to successive layers of cork cells, the *periderm*. The formation of this layer of air-filled cells, which are, of course, physiologically dead, cuts off all external structures from the vital fluids of the plant, and it is thus that the fall of the leaf is brought about, the layer of cork extending across its base. The periderm may be of considerable thickness, the lenticels (q.v.) growing with it so as to form perforations, or tubes filled with loose dried powdery cells, extending through it to the surface, as is familiar in thin slices of cork. With its growth, and that of the wood of the stem, the outer portion of the cork may be split by longitudinal furrows as in oak, elm, chestnut, etc., or it may flake off, as in the birch and plane, or by cell-division radial as well as periclinal it may accommodate itself to the increased girth, as in beech, sycamore, etc. The term cork is specially applied to the periderm of *Quercus Suber*, the Cork Oak, a native of the Mediterranean region. The first crop, taken off trees ten to fifteen years old, which is furrowed, is known as *virgin cork*, and is used to ornament ferneries. Subsequent crops are taken every seven years or thereabouts, care being taken not to injure the phellogen. The stripping is said to accelerate growth, though it probably renders the wood less dense. The curved sheets are flattened by weights when under water and charred to close their pores (lenticels). Great Britain imports about 22,000 tons of cork in the rough and over 2,000 tons manufactured. The best comes from Spain, France and Portugal also contributing. Besides its use for bungs and bottle-corks, cork is used for boot-soles and to line hats, and refuse cork treated with rubber is the material of the floorcloth known as *kamptulicon*, now generally superseded by linoleum.

Cork Leg. [LEG.]

Corkwing (*Crenilabrus melops*), called also the gold-sinny, a wrasse (q.v.), common on the British coasts.

Corleone, a Sicilian town in the province of Palermo, from which it is distant twenty miles south. It is on the slope of a hill near the source of the Belici. There are two castles, said to be Saracen, one of which is ruined and the other used as a prison. The inhabitants are descended from a Lombard colony.

Corm, a short, fleshy, underground stem, generally consisting of a single internode and enclosed in a few sheathing membranous leaves. It bears buds on its upper surface or laterally and adventitious roots below; but differs from a bulb, which it resembles externally, in being a solid stem, and not being mainly made up of fleshy leaf-scales. Corms occur in the snowdrop, *Crocus*, *Gladiolus*, and *Arum* among Monocotyledons, and in *Cyclamen* among Dicotyledons. In some Ariods corms reach an enormous size. Such a rhizome (q.v.) as that of the onion-couch may well be considered as a chain of corms, and the corm of *Arum* is sometimes termed a shortened rhizome.

Cormorant, a cosmopolitan genus (*Phalacrocorax*) of the Pelican family with thirty-five species frequenting coasts and islands. The face and throat are naked; the bill is long, and the upper mandible much curved at the point, while the lower supports a dilatable membrane which forms a gular pouch. The legs are short, strong, and abdominal, with three toes in front and one behind, all united; the claw of the middle toe is pectinated

and probably used to dress the plumage and to free the bird from insect pests. The wings are of moderate length, and the tail-feathers stiff and rigid. Many of the species develop crests or wattles in the breeding season. These birds feed exclusively on fish, of which they devour enormous quantities. Two species are British: the Great, Black, or Common Cormorant (*P. carbo*), and the Shag, Scart, or Green Cormorant (*P. graculus*). The first species has the range of the genus. Its general plumage is black, with a velvety bluish tinge on the under surface, and there is a white patch on the thigh; the feathers on the head of the adult are elongated to form a crest; gular pouch yellow, margined with white. This bird was formerly used in England, as it still is in China, for fishing. The Shag is a somewhat smaller bird, and has dark-green plumage, with metallic reflections on the under surface. It is crested like its congener. It is more essentially a marine bird than the Common Cormorant, which often nests inland. In the seventeenth century there was a colony of *P. carbo* at Reedham in Norfolk, and down to very much later some built in the trees round the decoy at Fritton, Suffolk.

Corn, a general name for the fruit of the cereal grasses (q.v.). In England the term is used generally for wheat, but by horse-keepers for oats, and in the United States it means maize. In 1888 the quantity of wheat sold in the 187 chief market towns of England and Wales was nearly $2\frac{1}{2}$ million quarters, its price averaging 31s. 11d. per quarter. In the same year Britain imported $57\frac{1}{4}$ million cwt., besides nearly 17 million cwt. of wheat-flour. The total imports of grain and flour in that year were valued at $51\frac{1}{4}$ millions sterling, of which $16\frac{1}{4}$ millions came from Russia and $15\frac{1}{4}$ from the United States. In 1889 nearly 3 million quarters were sold in the market towns, and $58\frac{1}{2}$ million cwt. imported, besides over $14\frac{1}{2}$ million cwt. of wheat-flour, whilst the average price was 29s. 10d. per quarter. In 1890 the price averaged 31s. 11d. per quarter, and Britain imported nearly $60\frac{1}{2}$ million cwt. of wheat and $15\frac{3}{4}$ million cwt. of flour.

Cornaro, the name of a noble Venetian family, of whom the most noted are:—(1) CATERINA (1454–1510), who married James II. of Cyprus, and after his death started a sort of court of poets and scholars at Asolo. Her portrait by Titian is well-known. (2) LUIGI (1467–1566), who after a stormy youth entered upon a course of strict temperance and moderation, and lived to a great age. He wrote at the ages of 83, 86, 91, and 95 upon temperance, and his works have been widely read.

Cornbrash, one of the most persistent divisions of English Jurassic rocks, varying from 5 to 15 feet thick, traceable from Dorsetshire to Scarborough, forming the uppermost member of the Bathonian (Lower) Oolite, and named from its crumbly or "brashy" soil and great fertility. This latter character is attributed to an exceptional percentage of phosphate of lime.

Corncrake, or LANDRAIL (*Crex pratensis*), a wading bird visiting Britain about May and leaving in autumn. It is about a foot long, with reddish-brown plumage, streaked with black on the upper surface. Corncrakes are exceedingly shy, and are far oftener heard than seen. The cry, which resembles the noise made by drawing the thumbnail or a piece of wood sharply across the teeth of a comb, is uttered only by the male, and ceases after incubation. Long grass and standing corn are their favourite haunts, and, though they swim well, they do not take to water unless compelled to do so. They are much valued for the table.

Cornea, the transparent anterior portion of the eyeball. [EYE.]

Corneille, PIERRE (1606–1684), one of the fathers of French drama, born at Rouen. His father, who was an advocate, and the Master of Woods and Forests, was ennobled in 1637, an honour which was confirmed to the son in 1669. After being educated by the Jesuits Corneille became an advocate at 18. His first play, *Mélite*, was given to the world in 1629, to be followed in 1632 by the tragedy of *Clitandre*, and in 1633 by a comedy, *La Veuve*. In the next year appeared two other comedies, *La Galérie du Paris* and *La Suivante*. In 1634 he was chosen to write a Latin ode of welcome to Richelieu, who took him up, and made him one of the five poets whose work it was to polish up the Cardinal's literary work. Corneille soon displeased Richelieu, though he was afterwards restored to favour. In 1635 he produced *Place Royale* and *Médée*, and in 1636, *l'Illusion Comique*, and his masterpiece, *The Cid*. But the jealousy of his contemporary rivals drove him in disgust to Rouen, where he remained three years. In 1640 he published *Horace*, which he dedicated to Richelieu, who had taken him again into favour. He then married. His next piece was *Cinna*. In 1640 also appeared *Polyeuete*, and *Le Menteur*, which bears the same relation to French comedy as does *Le Cid* to tragedy. In 1647 he was elected to the Academy after being twice rejected. In 1653 he gave up writing for the stage, but six years later he wrote *Edipe* for Fouquet, a play which brought him to the notice of Louis XIV., and gained him a pension. From this time his pieces, except *Psyche*, in which Molière collaborated, and into which Corneille put some of his best work, fell off in power, and he sank into what was almost poverty. His pride and reserve, increased by his poverty, prevented his succeeding like Racine, with whom he holds the balance as the first dramatist of France. But he was a man of warm affections, and was very fond of his brother, who was himself a prolific writer. His great fault was a childish jealousy which, however, did not degenerate into envy. Corneille, though his work is very unequal in merit, is considered the Shakespeare of France.

Cornelia, a patrician Roman lady, the daughter of Scipio Africanus the elder, and mother of Tiberius and Caius—the two Gracchi—and of Cornelia who married Scipio Africanus the younger. After her husband's death she would not marry again, though she had a royal suitor in the person

of King Ptolemy, but gave herself to the education of her children, whom she called "my jewels." After the murder of Caius Gracchus she went into literary retirement at Misenum.

Cornelisz, LUCAS (1495–1582), a Dutch portrait painter, born at Leyden. His father, who was a painter, taught him, but he was obliged to support himself by taking domestic service, whereby he gained the sobriquet of "Kok." In 1527 he came to England, and was appointed court painter by Henry VIII. For a time he was in Italy at Ferrara.

Cornelius, PETER VON (1783–1867). the leader of the German art revival. Born at Düsseldorf, he began to paint at an early age. His first public work was the decoration of the choir of a church at Neuss. At 26 he made some designs from *Faust*. In 1811 he went to Rome, and there with his associates and disciples he inaugurated a new German school of decoration. Among his work of that period were designs from the Nibelungen Lied. He went from Rome to Düsseldorf, and from there to become director of the Munich Academy. He designed the frescoes for the Ludwigskirche, the best known being *The Last Judgment*. He also decorated the Pinakothek and the Glyptothek. At Berlin he executed cartoons from the Apocalypse for the Campo Santo, the Royal Mausoleum. Though a great and powerful designer he was of no great merit as a colourist. He followed the Italian school, though his work showed evident traces of the influence of Albert Dürer. He came to England in 1841 and was consulted upon the subject of the Parliamentary frescoes.

Cornell University, near the town of Ithaca, New York, called after its founder, Mr. Cornell. It is of considerable extent, and includes a college for women. In some respects it approaches to the nature of a communistic establishment, since its students may, if they please, support themselves by labouring for the community. In return for income secured to it by the State, the university must educate free of cost and instruct in agriculture and mechanic arts 128 students from the State of New York. The endowment of the university is about £500,000. Besides general courses in arts, literature, and science, the university gives instruction in a great variety of special subjects. Englishmen will remember that Goldwin Smith spent some time there as a Professor.

Cornet. (1) A brass soprano wind instrument which may be looked on as a modification of the trumpet, and which occupies an intermediate position between the trumpet and the bugle. It possesses three slides for producing sounds other than the open notes, and these three slides are put into operation by three valves, which have given the name of *cornet-à-piston* in French to the instrument. It was formerly called the *cornopean*, and crooks were inserted between the mouth-piece and the body of the cornet to alter the pitch, but these are now obsolete. As the instrument is a comparatively modern invention, no provision is made for it in ancient orchestration, but it is much used both in combination and as a solo. Military bands often employ a smaller kind of cornet. The organ sometimes possesses a cornet stop. (2) From Italian *cornetto* (a small flag), denoting the junior grade of commissioned officers in a cavalry regiment, equivalent to *ensign* in the infantry, whose special duty it was to carry the standard. At the army changes in 1871 this rank was abolished, the junior grade of officers in the cavalry as in the infantry being called sub-lieutenants.

Corn-flour is made by finely grinding maize.

Cornish, the inhabitants of Cornwall, present a red and a dark type, some being the darkest people in England. There appears to be a primitive Iberian substratum mixed, at an early date, first with Gadhælic and later with Kymric Celts. [CELTS.] Prof. J. Rhys thinks that Gadhælic survived in Cornwall down to the sixth century, after which Kymric became the exclusive language, gradually yielding to English and at last dying out about 1770. Except some glosses and the Cotton MS. vocabulary, the oldest known specimen of Cornish is 36 lines of a drama discovered in 1877 by Henry Jenner on the back of a charter of about the year 1400. The language still lives in the universal geographical nomenclature, such elements as *tre* (village or town), *pol* (lake, pool), *pen* (head, crest) occurring at every step, whence the local saying, "By tre, pol, and pen, you may know the Cornishmen." The numerous so-called druidical remains (dolmens, menhirs, hanging stones) are generally attributed to the Celts, but they must obviously be referred to the same race that erected similar structures in Brittany as well as in North Africa and other regions where the presence of Celts has never been suspected. This race represents the non-Aryan element occupying West Europe before the arrival of the Aryan Celts, and now merged with them.

Cornish Boiler, a cylindrical steam-boiler with a single flue passing from end to end. The diameter of the flue is usually three-fifths of the diameter of the boiler itself. The furnace is built in the front part of the flue; it is backed by a bridge of firebrick or of hollow metal, inside which the water may flow. Effective eddies are produced in the flow of the burning gases by corrugating the flue and by the use of Galloway tubes. These latter are hollow tubes joining opposite sides of the flue, thus permitting the water to flow across and so be heated. Besides increasing the heating surface, they strengthen the structure considerably.

Cornish Engine is an old type of single-acting beam-engine, employed in pumping water up from mines. The steam is carefully economised, and is used expansively.

Corn Laws. In England, those laws which for a long period regulated the import and export of corn to and from the country. In 1360 a law was passed prohibiting the export of corn without the king's licence, and a law of 1436 enacted that corn should not be exported if the price were more than 6s. 8d. per quarter. A law of 1463 enacted that no imports should be allowed till the home price exceeded 6s. 8d. per quarter. By the law of

1534 all export was prohibited, but a law of 1562 allowed it when the price was under 10s. per quarter. After the Restoration, Scotland, which had under the Commonwealth occupied the same position in this matter as England, had its own regulations, and the two countries treated each other on questions of corn trade as foreign nations. In 1670 importation was not allowed till 53s. 4d. per quarter was reached, and a heavy duty was imposed, and in 1689 a bounty of 5s. per quarter was granted until 48s. had been reached, in order to encourage exportation, for at this period the country produced more corn than she could consume. Other changes were introduced from time to time, and the increase of population and altered circumstances led to the abolition of bounties in 1814. In 1815 no importation was allowed while the home price was below 80s. In 1828 the sliding scale, by which the duty lessened as the price rose, was introduced more systematically than before (it had first been adopted in 1791), but this was objectionable as leading to a great deal of speculative gambling. In 1842 Sir Robert Peel modified the sliding scale, but Protection of British corn growers was still looked on as a fundamental principle of national economy. The feelings of the country at this period are fully reflected in the cartoons of the early volumes of *Punch*. In 1836 an agitation had already begun in favour of an abolition of restrictions upon free trade in corn, and in 1839 this led to the formation of the Anti-Corn-Law League. In 1846 Sir Robert Peel was converted to its views, and free trade was inaugurated. There exists a lithograph dedicated to Richard Cobden to commemorate the triumph of the League, and in this, amid emblems of Commerce, Freedom, and Industry are busts of the three chief promoters of the movement—Cobden, Bright, and Villiers.

Corns. A thickening of the epidermis originating from undue friction or pressure may proceed to such a degree as to result in the production of a horny outgrowth or excrescence, to which the term corn is applied. This condition commonly obtains in the human foot as the result of ill-fitting boots, and may, if neglected, give rise to much annoyance. Treatment consists first in removing the cause of the trouble, that is to say, a boot which does not exert undue pressure upon any prominence of the foot must be obtained. This done, the fresh development of corns will become a thing of the past. In the second place an existing corn may require to be dealt with by special measures, so as to reduce the foot to its natural condition. The employment of a corn plaster to remove pressure from the surface of the corn is usually sufficient to secure this, or the spot may be painted with some such application as the preparation containing salicylic acid, collodion, and extract of cannabis indica, which is now so largely employed.

Cornucopia (from Lat. *horn of plenty*), an allegorical representation of abundance and fruitfulness by a curved horn from the open mouth of which different kinds of fruits overflow. The name is also used in France to denote a case for holding bonbons.

Cornulites, a somewhat anomalous genus of fossil worm-tubes found in the Silurian and Devonian rocks. The best known species is *C. serpularius*, which is abundant in the Wenlock limestone around Dudley. In its young form it is adherent to shells, but the adult is free; in this case it consists of a ringed cylindrical tube. They often grow in groups, and are then rectangular in section; as these are marked by external longitudinal ridges like "costæ" (q.v.), and as the chamber is in some species divided by a series of horizontal layers, like Tabulæ (q.v.), they present a certain resemblance to corals. The whole group is in need of revision, especially as it has intimate affinities with the supposed Pteropod *Tentaculites*.

Cornwall, a county at the S.W. extremity of England, the southernmost of the English counties. It forms the peninsula that lies between the Bristol and English channels, and is at no point more than twenty miles from salt water. It is eighty-one miles long by forty broad, and contains 1,365 square miles, and includes the Scilly Isles, which lie twenty-four miles west. More than half is cultivated, but much is moorland, mountain pasture, and rugged, being a continuation of Dartmoor, and forming the watershed between the two channels. The greatest height attained is 1,368 feet in Brown Willy. The chief rivers flow to the south. There are two harbours on the N. coast—Camel, with Padstow and the bay of St. Ives. The cliffs are bold and steep, and are alternated in parts by drifting sea-sand, which has swallowed up churches and villages. The S. coast is much indented, the largest opening being Mounts Bay with Penzance. To the E. of the Lizard is Falmouth Bay and harbour, and Plymouth Sound, and the estuary of Fowey. The river Tamar—called in its lower course Hamoaze—is navigable for nineteen miles from Plymouth Sound. The Fal, with a course of twenty miles, falls into Falmouth harbour. The Camel is twenty-nine miles long, the last ten miles of its course being tidal. Between the mainland and the Scilly Islands is said to be a submerged tract which formed the *Lyonesse* of the Arthurian legend. The soil is mainly clay-slate, with protruding granite, quartz, and felspar. But the geological nature of the country around the Lizard is very complex, and the rock is of igneous origin. The mining of Cornwall is by no means so extensive as formerly, though the county is extremely rich in minerals, of which tin, lead, copper, iron and zinc are the chief. The deepest mine—half a mile—is at Dolcoath. Tin and kaolin are the substances now most worked. Pilchard, herring, and mackerel fishing are extensively carried on. The climate, though damp, is extremely mild, and many foreign shrubs, such as the camellia, grow in the open air. The Scilly Isles have become an important source of the supply to the English market of flowers and early vegetables. The county sends seven members to Parliament. Till lately joined to the see of Exeter, Cornwall has now its own Bishop of Truro. The Duchy of Cornwall is an appanage of the princedom of Wales, and the Prince of Wales derives from this source an income of £61,000 a

year. The county abounds in crosses and cromlechs and other relics, both of early British Christianity and of still earlier periods. The Cornish language, except in isolated words and expressions, has perished. The last person who knew the language is said to have been one Dolly Pentreath, who died in 1778. [CORNISH.]

Cornwallis, CHARLES, MARQUIS (1738–1805), English general and statesman, son of Earl Cornwallis. He was educated at Eton and at the military academy of Turin, and acted as aide-de-camp to the Marquis of Granby in the Seven Years' war. In 1762 he succeeded his father in the earldom, and in 1766 he had attained the rank of colonel. In 1770 he was governor of the Tower, and in 1771 major-general. Sent to take part in the American War of Independence, he was in 1782 besieged at Yorktown by the French and American armies and the French fleet and forced to capitulate, a step for which he was not blamed. In 1786 he was made Governor-General of India, and, besides doing much in the way of reform, he forced Tippoo Sahib into a treaty beneficial to England. After being made Marquis in 1793, he returned to India as Viceroy in 1798. After negotiating the treaty of Amiens in 1802, he was sent a third time to India, in 1805, as Governor-General, but died on his way up-country.

Cornwallis, THE HON. WILLIAM, British admiral and naval tactician, was son of Charles, fifth Lord Cornwallis, and was born in 1744. He became a lieutenant in 1761, a commander in 1762, and a captain in 1765; but although he did good service in each of these ranks and, as captain, very greatly distinguished himself on numerous occasions, it was not until after he had in 1793 attained his flag that he won his great triumph. In 1795 he was cruising with five line-of-battle ships and two frigates when he fell in with a French force of thirteen line-of-battle ships, fourteen frigates, and other craft. The manner in which Cornwallis made a running fight from the superior force, and escaped, losing no ship and gaining undying honour for his courage and skill, has never been equalled in the history of sea tactics. In 1801 he commanded in the Channel, and again on the renewal of the war in 1803, and he held the position until 1806. He had reached the rank of full admiral in 1799, and when he died in 1819 he was almost the senior officer of the navy.

Coroados, a primitive Brazilian people, formerly dominant about the head waters of the Rio Embotetin, where they were at constant warfare with the powerful Guaicuru nation. Both sexes went naked, and they were troglodytes, living in caves and the rocky recesses of the mountains. Later some became civilised, and built themselves huts four or five feet high. Some bands of Coroados are still met in various parts of the interior, where they are regarded as a common enemy by all the other natives.

Corolla, the inner floral envelope or whorl of the perianth, which is generally of a delicate or "petaloid" texture and white or coloured, serving, at least in many cases, to attract insects (or more rarely birds) and so secure the cross-pollination (q.v.) of the flower. It may also be scented. The leaves of the corolla, which are called *petals*, have commonly a narrow base, simple outline, entire margin and broad obtuse apex, being sometimes distinguished, as in the wallflower, into a *claw* and *limb* or blade; but they may be notched, as in chickweed, fringed, as in pinks, or torn (*laciniate*), as in the ragged robin. They are generally three in number among Monocotyledons, and five among Dicotyledons; but in cultivation many flowers become "double" by the replacement of some of their stamens by additional petals. The petals may be distinct (*polypetalous*) or coherent, from intercalary growth carrying them up on a tube (*gamopetalous*); and they may spring from below the ovary (*hypogynous*), in a ring round it (*perigynous*), or from the top of it (*epigynous*). These characters are of primary importance in classification. The corolla may be *polysymmetric*, as in the rosaceous, caryophyllaceous, and cruciform types among *Polypetalæ*, and in the tubular, campanulate, urceolate, funnel-shaped, salver-shaped and rotate types among *Gamopetalæ;* or it may be *monosymmetric*, as in the papilionaceous, bilabiate and ligulate types. Flowers that are habitually self-pollinated have commonly white, uniformly-coloured or inconspicuous corollas: those adapted to insect-fertilisation (q.v.), besides being conspicuously coloured, are often marked by dots or lines known as *honey-guides* and often themselves secrete honey. In the bud the petals are variously folded [ÆSTIVATION], and in duration they may be *caducous*, as in the vine, falling as the flower opens; *deciduous*, falling after fertilisation; or, though rarely, *persistent*, as in *Campanula*.

Corollary, in *Logic* or *Mathematics*, is an easy deduction appended to a proposition that has been proved.

Corolliflorae, a term applied by A. P. de Candolle in 1813 to a class of exogenous (dicotyledonous) plants in which the petals are united and hypogynous, and the stamens are usually epipetalous, as in the *Labiatæ*, *Solanaceæ*, etc. [GAMOPETALÆ.]

Coromandel Coast (from *Chola*, an ancient people of India, and *Mandal*, a region), the name given to the east coast of India, from Cape Comorin to the mouth of the Krishna. The coast is constantly beaten by a heavy surf not to be faced in ordinary boats, and contains no harbour or safe place of refuge.

Corona, or CORONET. 1. A term applied to the whorl of hair-like appendages to the petals of the passion-flowers and to the similarly ligular structures that unite to form the cup or tube in the flower of *Narcissus*. It is also applied to the five teeth round the apex of the archegonium (nucule) in the *Characeæ* (q.v.), each composed of one cell in *Chara*, of two in *Nitella*.

2. In astronomy, is a very remarkable feature in an eclipse of the sun. The corona is an aureole of light surrounding the black mass of the interposed

moon, extending for several degrees from the surface, and exhibiting radial projections of varying brightness. [ECLIPSE, SUN.]

Corona Borealis, a pretty little constellation between Hercules and Bootes, the more prominent members of which are seen to form a semicircle with its convex side towards Arcturus.

Coronach, a Gaelic word used in the Scottish highlands to denote a loud choral crying and mourning for the dead. In Ireland this mourning is called "keening."

Coronation, the formal taking up by a sovereign of the regal authority as opposed to his or her accession, which takes place, as a matter of course, immediately upon the demise of the Crown. The coronation in England is an occasion of much antiquarian display and ceremony. The essentials of the coronation are the religious part of the ceremony, which consists in the crowning and anointing of the sovereign by the Archbishop of Canterbury; and the political part of it, whose most important part since 1688 is the taking of an oath by the sovereign to govern according to statutes made by Parliament, to administer law and justice in mercy, and to maintain the Protestant religion. This part of the oath led to the long postponement of Catholic emancipation owing to the conscientious scruples of successive kings. Beneath the coronation chair of England is the stone of Scone, upon which the kings of Scotland used to take their seat at their coronation. This stone, said to be Jacob's pillow, and to have been carried to Tara in Ireland and thence to Scone, seems geologically to have originated at Scone.

Coronea, a town of Bœotia, near Lake Copais. Here, in 447 B.C., the Bœotians defeated the Athenians, and in 394 Agesilaus defeated the allied Greeks.

Coronella, a widely distributed genus of Colubrine Snakes. *C. lævis*, common in the warmer parts of Europe, is found in the New Forest. In colour, size, and habit, it resembles the viper, and bites fiercely, but soon becomes tame in captivity. It feeds chiefly on lizards.

Coroner, a very ancient officer of the Common Law, so called because he has principally to do with pleas of the Crown or such wherein the sovereign is more immediately concerned. He is now appointed in boroughs by the Borough Council under the Municipal Corporation Act, 1882, and in counties by the County Council under the Local Government Act, 1888, prior to which county coroners were elected by the freeholders in each county. The Consolidated Coroners' Act, 1887, defines the coroner's jurisdiction as follows:—"Where a coroner is informed that the dead body of a person is lying within his jurisdiction, and there is reasonable cause to suspect that such person has died in prison or an unnatural death, or has died a sudden death, the cause of which is unknown, or that such person has died in prison or in such place or under such circumstances as to require an inquest in pursuance of any Act, the coroner, whether the cause of death arose within his jurisdiction or not, shall issue his warrant for summoning not less than 12 nor more than 23 men to appear before him to inquire as jurors touching the death." The coroner has also jurisdiction to inquire concerning "treasure trove," and in some cases acts as substitute for the sheriff, as when that officer is incapacitated by interest, etc. Coroners are usually elected for life in England. In Scotland the duties devolve upon an officer appointed by the Crown and known as the "Procurator Fiscal." In the United States the coroner is elected for a specified time by the voters in each county. [TREASURE TROVE.]

Corot, JEAN BAPTISTE CAMILLE (1796–1875), a French landscape painter, born in Paris and educated at Rouen. He was apprenticed to a draper in Paris, and, in spite of his leanings to art, remained in this life till the age of 26, when he entered the studio of Machallon, and then that of Victor Bertin. He then went to Italy for many years, and in 1827 he first exhibited at the Salon of Paris his *Vue prise à Narni*, and *La campagne de Rome*, and continued to exhibit for fifty years. He was appointed to the Legion of Honour in 1846, and in 1867 was made officer of the order. As a landscape painter he followed the "poetry of the landscape" rather than realistic effects, and his works, like those of Millet, have something in them of sadness, but more of tenderness and delicacy. Among his best works are *Danse des Nymphes*, *Soleil Levant*, *Soleil Couchant*, *Effet de Matin*, *Agar au Desert*, *Souvenir d'Italie*. Two works, *Danse Antique* and *Le Bûcheron*, were exhibited after his death. Corot was of a sympathetic nature, and very kind-hearted, and was much esteemed by fellow-artists, who called him *Père Corot*.

Corozo Nut, the Spanish name for the seed of the vegetable ivory (*Phytelephas macrocarpa*), a tree allied to the palms, native to the northern parts of S. America. The albumen becomes as hard as ivory, and is turned into buttons, door-knobs, etc.; but the supply is declining. When young it is edible.

Corporation. A corporation is sometimes called an artificial person, that is, a person which exists by virtue of a legal fiction, for which purpose it must have a name. It is a body created by Act of Parliament, by charter, or by letters patent. It may be created either for trading or for general purposes. It must have a common seal, and all its contracts originally required to be under that seal. The living members of the corporation administer the property and do all the necessary acts for its acquisition and preservation, but the property does not belong to the individuals in definite shares nor to all of them; it belongs to the artificial person or to the name which the corporation has. In the case of joint stock companies and the like, no shareholder is the owner of a fractional part of the property. His share is an interest which he can transfer to others or which is transferable by will or intestacy, pursuant to the rules of the corporation.

But it is not a share like that of a tenant in common or joint tenant. Numerous relaxations of the above-mentioned rule as to common seal have been latterly admitted, and the general state of the law now is that for contracts of an ordinary every-day occurrence a seal is not necessary, and that if such contracts have been executed and the corporation has had the benefit of them, then the corporation is liable to be sued for the price, but that upon executory contracts of that sort the corporation semble is not liable unless the contract is under seal. And the old law requiring the seal is still in force with regard to all contracts of an extraordinary kind, not within the usual business of the corporation, so that upon these latter kinds of contract, in the absence of the seal, the corporation cannot be sued, notwithstanding the contract is executed and the corporation has had the benefit of it and *à fortiori* if the contract in such case is executory. But the above rules do not apply to a corporation sole (*i.e.* a bishop or parson), but only to a corporation aggregate. Moreover, where a corporation aggregate is constituted by Act of Parliament, the Act commonly defines the mode by which and the purposes for which it may contract, and if such a corporation exceeds the purpose so defined, it cannot, even by affixing its common seal, make a valid contract, inasmuch as that would be *ultra vires*. A corporation is, of course, liable for torts. The largest class of corporations and those most varied in their object and character are lay and civil incorporations. Among these are the Universities of Oxford, Cambridge, Durham, and London, the municipal corporations of different cities and boroughs, the Bank of England, the Colleges of Physicians and Surgeons, the Royal Society, Royal Academy, and Society of Antiquaries, and numerous commercial and other companies erected by charter or by Act of Parliament.

Corpus Christi, a festival in the Roman Catholic Church which commemorates the institution of the Eucharist, and is in special honour of the Host. It was instituted in 1264, and takes place upon the Thursday next after Trinity Sunday. In France it is called *Fête-Dieu*.

Corpus Delicti, in criminal jurisprudence, the actual fact of an offence, that is, the sum total of the operation required for its commission.

Corpusculum, a term, now unnecessary, formerly applied to the structure in the ovule of Gymnospermous plants which is now known to represent the archegonium (q.v.). There are generally two or more corpuscula embedded in the apex of the archisperm, which in this group fills the embryo-sac before fertilisation. Each consists of a large central cell filled with vacuolated protoplasm and a rosette of small neck-cells above it.

Correggio, Antonio Allegri (1494–1534), was born at Correggio (whence his name), in Modena. He studied anatomy under Dr. Giovanni Battista Lombardi, who is supposed to have been the model for his *Il Medico* design, under his uncle Lorenzo and others; and modelling under the sculptor Begarelli. He must have been in easy circumstances, for he used expensive colours, and often painted upon copper. In 1514 he painted an altar-piece (now in the Dresden Gallery), and his *Arrest of Christ* is a good example of his early style. In 1520 he painted a fresco of *The Ascension*, and in 1530 one of *The Assumption*. His *Ecce Homo*, and *Cupid, Mercury, and Venus*, both in the National Gallery, are among his best works. At Venice there is *Leda, Danae, Vice and Virtue;* at Berlin, *Leda, and Girls Bathing;* at Vienna, *Jupiter and Io; Jupiter and Antiope* at Paris. For his *Zingarella* (at Naples) his wife is said to have been the model. Correggio is the chief of the Parma group of the Lombard school, and his distinguishing feature is his management of light and shade.

Corrèze, a French department inland, in the old province of Limousin, W. of Puy de Dôme and E. of Dordogne, in lat. 44° 55 to 45° 40′ N., with an area of 2,265 square miles. Its capital is Tulle. The surface is hilly and interspersed with plains. In the N., spurs of the Auvergne Mountains separate the Dordogne and the Loire valleys, and the slopes of the mountains are clothed with forests. The soil generally is poor and thin. The chief minerals are coal, iron, lead, and alabaster. There is much granite.

Corrib, a lake in Galway and Mayo, the second largest lake in Ireland. It is of irregular shape, 25 miles long by a breadth of from 1 mile to 6, with an area of 68 square miles. The Galway river carries its waters to Galway Bay, and at the S. end the loch receives the waters of Lough Mask and some rivers by underground channels. There are some islets in the lough, and on the W. mountains rise to a height of 3,000 feet. There are stone circles in the neighbourhood.

Corrientes, a town of the Argentine republic, capital of a province of the same name, 15 miles below the junction of the Parana and the Paraguay. The name is derived from seven currents which prevail in the river. The town is surrounded by orange groves. Steamers ply between Corrientes and Buenos Ayres. The province consists of swamp, jungle, and lakes, and is well wooded. The temperature is high. Cattle raising is the chief industry.

Corrosive Sublimate, a chloride of mercury represented by the formula $HgCl_2$, *i.e. mercuric chloride*. It is generally made by heating a mixture of mercuric sulphate and salt, when the chloride sublimes over. It is slightly soluble in water. It is very poisonous, and its solution is used largely by taxidermists and entomologists for the preservation of specimens. It is employed in the formation of various chemical and pharmaceutical preparations, as Nerster's test, sal-alembroth, fusible and infusible white precipitate, etc.

Corrugated Metal, a device for strengthening metal structures by the employment of corrugations in the metal employed. It has been extensively adopted for temporary buildings, sheet-iron coated with zinc being most generally used. Boilers and boiler-flues are much strengthened, and their heating surface increased, by being corrugated.

Corsair (connected with *course*, fr. Lat. *currere*, to run), generally a pirate or sea-robber, and more particularly one of the Algerian pirates whose depredations made them the scourge and terror of the Mediterranean and neighbouring seas down to a comparatively recent date. In the later Middle Ages, and, indeed, far down into modern times, it was a common act of Christian charity to give or bequeath money for the redemption of Christian captives kept in slavery by the Algerian pirates. It was not till 1816 that they received their real deathblow, and they lingered on in various parts of the Mediterranean till a much later period. The name has also been employed to designate a privateer sailing with letters of marque.

Corset (from Lat. *corpus*, body), a tight-fitting bodice containing busks (q.v.), and worn principally by women. Incalculable harm is done by tightly-laced corsets in displacing and crushing the internal organs and impeding the circulation.

Corsica, an island in the Mediterranean lying to the north of Sardinia, from which it is separated by the Straits of Bonifacio, now a department of France, to which it has belonged since 1814, divided into five arrondissements, containing sixty-two cantons and 363 communes The island contains 3,380 square miles, and is 116 miles long by 52 broad, being 54 miles W. of Tuscany, 98 S. of Genoa, and 106 S.W. of Nice. The surface is generally mountainous, central ranges running through the island from N. to S. and dividing it into two natural districts. The principal heights are Cinto, Rotondo, and Pagli-Orba, which rise to a height of between 8,000 and 9,000 feet. To the south and west spurs jut out into the sea and form bays and harbours. On the east are alluvial plains with lagoons and swamps, and much of this region is fruitful in olives, almonds, figs, and vines. The rocks are chiefly granite, gneiss, and mica slate. Though antimony, copper, and lead are to be found, the minerals are little worked. There are several rivers, but they are short, and not navigable. The longest is Golo on the N.E. coast, which flows through the salt-water lake of Biguglia. The west coast is broken and indented with many harbours, of which the chief is Ajaccio. The east coast is much more regular, and the only harbours of importance are Bastia, towards the N.; Porto Vecchio, S.E.; and the harbour of Bonifacio in the S., with a town of the same name. The summits and slopes of the hills are covered with fine forests and by thick tangled brushwood called "mâquis" or "macchia," which afford shelter to brigands who are driven to the woods by the exigencies of the *vendetta*. This peculiar Corsican institution has been well described by Prosper Merimée in *Columba*, and its more modern aspect is set forth in *Mr. Barnes of New York*. The island does not produce much corn, but the olive and vine are largely cultivated, and oil and wine are exported, as well as chestnuts, honey, and wax. The mountain pastures are good. The moufflon or wild sheep is found. Besides cattle rearing, the other chief industries are the tunny, pilchard, and anchovy fisheries. However, most of the work of the island is carried on by foreigners. Ajaccio is the capital of Corsica, though Bastia is a more important town. Other towns are Corte and Sartene. The island has passed through many hands; the Moor's head, which is the badge of the island, and the Genoese patois which prevails among the people, mark some of its vicissitudes.

Corssen, Wilhelm Paul (1820–1875), a German philologist, born at Bremen, and educated at Berlin University, where he came under the influence of Boekch and Lachmann. He obtained a prize for his *Origines Poesis Romanæ*. He then went to Stettin and taught in the gymnasium, whence he was summoned to Pforta, where he remained for twenty years. In 1854 he gained a prize for a treatise on *Latin Pronunciation and Accent*. He studied the old Italian dialects, and from 1863–66 wrote some critical works. In 1870 he visited Italy to study the Etruscan remains, and tried to prove that the Etruscans and Romans were cognate races. On the Etruscan language he is probably the leading authority.

Cort, Cornelius (1536–1578), a Dutch engraver, born at Hoorn. He studied at Antwerp under Jerom Cockx. In 1565 he went to Venice, where he engraved copper plates for Titian. He engraved *St. Jerome in the Desert*, *Diana and Actæon*, *Diana and Calisto*. He returned to the Netherlands, and went again to Venice, to Bologna, and to Rome, engraving continually.

Cortes, Hernando (1485–1547), a Spanish soldier and statesman, born at Medellin, in Estremadura. He studied at Salamanca. He went to San Domingo in 1504, and accompanied Velazquez in an expedition to Estremadura, and was appointed alcalde in the capital. In 1518 Velazquez fitted out a trading expedition to Mexico, and gave Cortes command of the force, consisting of 550 Spaniards, 2,000 or 3,000 Indians, 15 horses, and a few guns. At Trinidad orders came to Cortes that he was superseded, but these orders he refused to obey, and persuaded his men to side with him. Having thus passed the Rubicon, he set out upon that romantic career of conquest which made him the glory of his day and a wonder for all time. Having entered Yucatan, he had his first battle with the natives at Tabasco, and was victorious. Here it was he met with his interpreter Donna Marina. The simple natives, who had never before seen horses or white men, were overwhelmed with awe, and looked on the Spaniards as gods and as children of the sun. Montezuma, the Mexican king, sent them presents, but begged them not to visit him. This, however, did not suit the plans of Cortes. who was already revolving his audacious schemes of conquest. His first step was to found Vera Cruz, and he then sent word of his doings to the Emperor Charles V. Then he burnt his ships, and marched against the republic of Tlazcala, and subdued it. As the Tlazcalans were at enmity with Montezuma, they became the faithful and valued allies of Cortes. At Chohela Montezuma made an attempt to surprise and capture the Spanish

general, but failed. Cortes advanced, and soon reached the great city of Mexico, which was situated on a great salt lake communicating with a fresh-water one, and only to be approached by three causeways, protected at each end by drawbridges. By the aid of his 300,000 Indian allies he seized Montezuma, and held him as an hostage. In the meantime a Mexican force had attacked Vera Cruz and had slain a Spaniard, which proved that the new-comers were, after all, mortal like other men. Cortes in revenge burnt to death seventeen officers, and compelled Montezuma in chains to witness their sufferings. He still retained the king in honourable captivity, and forced him to an act of vassalage to Charles V., and to pay 100,000 ducats.

Cortes acted like the great statesman he was; he searched for mines, forbade human sacrifices, and tried to give the Mexicans some idea of eastern civilisation. Hearing that an expedition had been sent against him by Velazquez, he left his lieutenant Alvarado with 200 men, and went with the rest against his new foe, whom he conquered, and whose men he won over to his own ends. Hearing from Alvarado that he was besieged by the Mexicans, Cortes, in June, 1520, met the Mexican army under Montezuma's brother, who had taken the place of the disgraced king, who was wounded by his own subjects while he was attempting to make peace, and either died from his wounds or of a broken heart. The Spaniards were obliged to make a disastrous retreat, but Cortes soon reversed the state of affairs in the battle of Otumba, where the Mexicans were tempted into trying their fate in open ground. In December, 1520, Cortes, with 500 foot, 40 horse, 9 cannon, and 10,000 Tlazcalans, advanced against the city, and with ships that he had had built he destroyed the canoes on the lake, and after a desperate struggle of seventy-five days the city was destroyed in August, 1521. Cortes displayed much wisdom as a ruler and organiser, and employed his lieutenant Alvarado to carry his conquests towards the south. He returned to Spain, and was sent back, to his mortification, not as Governor, but only as Captain-general. Disgusted with the methods of government employed by his successor, he spent ten years in exploration, and in 1540 returned again to Spain. The Emperor treated him with some coldness, and though he took him on an expedition to Algeria, Cortes was repulsed when he offered to take Algiers. The rest of his life was passed in neglect on the part of the Emperor, whom he is said to have once reproached for his unworthy treatment of a man who had given him more countries than his ancestors had left him cities; and in sorrow caused by the repudiation of his daughter by her husband. Cortes was buried at Seville, but his body was afterwards removed to Tezcuco, in Mexico.

Cortex, a tissue-system, differentiated at an early period in the development of the axis of most flowering plants, between the dermatogen or rudimentary epidermis and the plerome or fascicular and medullary portion. In its embryonic stage it is termed the *periblem*. As it passes partly into permanent tissue, its outer, hypodermal or subepidermal, layers of *primary cortex* frequently become *collenchymatous*, *i.e.* acquire a mucilaginous thickening of the corners of their cells. The inner cells may remain rounded and loosely-aggregated with intercellular spaces, and often contain stores of starch, whilst the whole tissue retains protoplasm and undergoes the cell-divisions necessary to accommodate it to the increasing girth of the axis. A layer of its cells remaining merismatic is known as the *phellogen*, and is in exogenous stems the usual source of the *periderm*, *secondary cortex*, or *cork* (q.v.). The cells beneath the phellogen generally retain their copious store of chlorophyll, which made the shoots green, even after they are buried beneath many layers of opaque brown cork. These green cells are the *phelloderm*. The elements of cortex generally remain parenchymatous, but isolated cells may become woody (sclerenchymatous), or be filled with crystals, and resin-passages and laticiferous vessels also occur in cortex.

Cortona (Lat. *Crotona*), a town of Central Italy, situated upon the top and slope of a hill overlooking the valley of Chiana and the Lake Thrasymene, is 2,130 feet above sea-level. It is a very ancient city, still surrounded by the ancient "Cyclopean" walls, and containing many Etruscan and Roman remains. In its churches are several paintings of old Italian masters, and in the museum of the Accademia Etrusca are many Etruscan relics, among them a curious bronze candelabrum. In the neighbourhood is a famous Etruscan tomb.

Corunna, a fortified Spanish seaport, capital of the province of the same name, situated on a peninsula in Corunna Bay, 263 miles N.W. of Leon, halfway between Capes Ortegal and Finisterre. The Upper town has walls and bastions; and the Lower town, once a fishing quarter, Pescaderia, is now the fashionable part. There is a commodious harbour, and since 1888 a quarantine harbour has been established. There are large cavalry and infantry barracks, and a notable college. A mile N.W. is the Torre de Hercules, now raised to a height of 360 feet, and used as a lighthouse with a powerful revolving light. There is considerable commerce, but the cattle trade with Portsmouth and Plymouth, which formerly employed many vessels between those places and what English sailors called "the Groyne," has fallen off. The town imports sugar, petroleum, hides, and coal. The industries are cigar-making, cotton spinning, glass-ware, and canned meat and fish, and there is some herring and pilchard fishing. Originally of Phœnician origin, the town has interesting historical associations of later date. Here, in 1386, John of Gaunt landed to claim the crown of Castile, in 1554 Philip II. embarked for England, and in 1588 the Armada refitted. In 1809 Sir John Moore covered the embarkation of his army in the face of Soult and 20,000 men, and lost his life. He was buried on the ramparts, and a monument has been raised to his memory in the garden of San Carlos.

Corundum, from an Indian name for the mineral, is the general term for native alumina or aluminium sesquioxide (Al_2O_3). It crystallises in six-sided pyramids and other forms belonging to the Hexagonal system, and is unaltered by acids or before the blowpipe, if alone; but dissolves in borax and gives a blue colour on heating with cobalt-nitrate. It has a vitreous lustre, its hardness is 9, and its specific gravity is 3·9 to 4·1. Transparent varieties are known as sapphires (q.v.), and are the most precious of gems. The colourless form is the *lux sapphire;* the blue, *sapphire;* the red, *oriental ruby;* the violet, *oriental amethyst;* the opaque grey or brown form is *corundum*, and the impure black form is *emery* (q.v.). The precious varieties come mainly from Burmah and Ceylon; but beds of corundum, several feet thick, occur in the Alleghanies.

Corvei, an ancient Benedictine Abbey of Saxony, on the Weser. It was founded in 822 as a colony from the Western Frank Abbey of Corbie in Picardy. It was well endowed, and was a centre of agriculture and prosperity. In the ninth and tenth centuries the school of Ausgar—the "Apostle of the North"—flourished here, and ranked next to Fulda. The abbots were princes of the Empire. In 1794 Pius VI. elevated it into a bishopric. It became Prussian in 1815. The fine Gothic church contains many monuments. Though the old library and archives were in great measure destroyed, there is still a fine library in the castle, which contains some of the old records.

Corvidæ, a family of Passerine Birds, containing the Crows, Choughs, Jays, Magpies, Nutcrackers, and the Piping and Tree Crows.

Coryate, Thomas (1577–1617), an English traveller and writer, born at Odcombe in Somerset, and educated at Westminster and Oxford. He was attached to the suite of Prince Henry, son of James I., and in 1608 he started on a tour over great part of the Continent, accomplishing 1,975 miles in five months. In 1611 he published his journal *Coryat's Crudities*, and *Coryat's Crambe, Colewort Twice Sodden*, and in 1612 he set out again for Constantinople and the East, through Persia and Afghanistan, reaching Agra in 1616. He died at Surat.

Corybantes, priests of Cybele, in Phrygia, who celebrated the worship of the goddess with wild dances and clashing of cymbals.

Corygaum, a village in the presidency of Bombay, 16 miles S. of Poona. It is notable as being the scene of a battle in which Captain Staunton with a small native force and twenty-four European artillerymen beat an overwhelming opposing force, and put an end to the Mahratta rule in 1818.

Corymb, an inflorescence in which the flowers are nearly on a level. though on stalks of different lengths, springing one below the other. It may be indefinite, the outer flowers opening first, as in the wallflower, stock, candytuft, etc., or definite, the centre flower opening first, as in hawthorn. It is thus either a variety of the raceme or of the cyme (q.v.). By this arrangement small inconspicuous flowers become collectively conspicuous, so as to attract insects. [Insect Fertilisation.]

Corynida, an order of the Hydroid Zoophytes or Hydroidea (q.v.). The members of this order are compound and form either plant-like or encrusting colonies. They form a skeleton or polypary, which is usually a simple chitinous membrane around the base and stems of the colony: in *Tubularia*, a common British example, the skeleton is a thin perisarc of chitin and forms a tube as far as the base of the polypes. In some the skeleton is calcareous as in some *Hydractiniæ*, and in the extinct genus *Parkeria*. The latter is a common fossil in the Cambridge Greensand, and occurs as spherical masses ranging up to two inches in diameter. It was once regarded as one of the arenaceous Foraminifera (q.v.), but is now usually placed in this group. *Hydractinia* is an encrusting form, and is composed of a series of layers separated by pillars. The genus began a little before the time of the Chalk, and is still living; it is the earliest of the Corynida, as the Palæozoic forms once referred to it are now known to belong elsewhere. Thus the Carboniferous *Palæcoryne* is part of a Bryozoan. The Corynida are all marine.

Coryphæus, the leader of the Greek chorus and choric dance. Formerly the leader of the ballet in the opera was a man, but in modern times the coryphée is a leading danseuse.

Coryphene, any fish of the spring-finned genus Coryphæna with six species from tropical and subtropical seas, the one (*C. hippurus*) being common in the Mediterranean. The body is compressed and elongate, and the dorsal extends from the head nearly to the deeply-forked caudal fin. The coryphenes are large and brilliantly coloured, and the flesh is well flavoured. The iridescent hues change rapidly just before death, as do those of the mackerel, a near ally. The name "dolphin" is often wrongly applied to them, and allusions to the changing hues of the "dying dolphin" really refer to *C. hippurus*.

Coryza. [Catarrh.]

Cos, a Turkish island of the Archipelago, off the coast of Asia Minor. It is 23 miles long by 5 broad, and consists partly of hills, and partly of fertile plains, which produce cotton, grain, lemons, wine, and silk, as well as the far-famed "Sultana" raisins, There are many ancient Greek remains. The capital, Cos, on the N.E. coast, has a fortress built by the knights of Rhodes, who once possessed the isle, and is said to occupy the site of a temple of Æsculapius. Apelles the painter. and Harpocrates the physician, were born here, and the wine and "Coæ vestes" were famous in ancient times.

Cosenza, capital of a province of the same name in Italy, 12 miles from the Mediterranean, and 262 miles S.E. of Naples. It is at the junction of the Crati and the Busento, the latter of which

flows through the town, and is crossed by a bridge of two arches. The town is in a deep valley where malaria sometimes prevails. There is a trade in oil, wine, silk, hemp, grain, earthenware and cutlery. Captured by the Carthaginians under Himilco, the town became Roman in 204 B.C. Alaric died here in 410 A.D.

Cosin, JOHN (1594–1672), an English bishop, born at Norwich, and educated there and at Cambridge, became Fellow of King's College, and secretary to Bishop Overall, of Lichfield, then chaplain to Bishop Neill, of Durham, and master of Peter House, and Dean of Peterborough in 1640. A friend of Laud, he hated the Puritans, who in their turn denounced his ritualistic tendencies, and found fault with the "Young Apollo," who introduced "Babylonish ornaments" and consumed much tobacco. He was deprived of his many benefices by the House of Commons, and was for nineteen years in exile at Paris. At the Restoration he was made Bishop of Durham, and established a model diocese on which he spent much of his great revenues. He was fully alive to his dignity as Prince-Bishop, and though a High Churchman, was a strict Sabbatarian, and he persecuted Catholics and Puritans with equal impartiality. Of his writings, the chief are, his *Private Devotions*, and his *Correspondence*. He had a share in the final revision of the Book of Common Prayer.

Cosine of an Angle, in *Geometry*, means the number by which any length on the one bounding line must be multiplied in order to give the length of its projection on the other. If the angle is zero between two lines, they are parallel, and the projection is equal to the original length. Hence the cosine of 0° is unity. Similarly we see that the cosine of 90° is zero, and, taking regard of the sense or direction in which the bounding lines are drawn, it follows that the cosine of an angle between 90° and 180° must be negative, diminishing to −1 at 180°. For no angle can it exceed unity. For cotangent, cosecant, and other such functions, *see* TRIGONOMETRY.

Cosmas, an Alexandrian merchant of the sixth century, who, after travelling in the East, retired to a monastic life in Egypt, and wrote a work on *Christian Topography*, in which he set forth some astonishing views of the universe, which he described as oblong, after the model of the tabernacle in the wilderness, with four walls and a roof, the earth lying in the middle, surrounded by the ocean, outside of which lay the Garden of Eden. His travels in India gained him the name of "Indicopleustes."

Cosmas, with **Damian,** two saints commemorated in the Canon of the Mass. They were Arabian brothers and physicians of the third century, living in Cilicia. They suffered martyrdom by beheading.

Cosmetic (from Gk. *kosmeō*, to adorn) signifies any substance used to improve the skin and hair. For their variety one has only to glance at the myriad advertisements which fill our papers and magazines. The best cosmetics are often said to be water, fresh air, and exercise, and an improved taste and a healthier physical condition of the modern woman have almost led to the abandonment of the coarser kinds of cosmetic, except upon the stage or for exceptional purposes.

Cosmogony (from the Greek *kŏsmŏs*, signifying order, and hence "the universe," and *gŏnŏs*, birth) is applied to any theory of the origin of the world. Though, almost at the dawn of intelligence, man is likely to be impressed with the orderly or regular and inevitable sequence of natural phenomena, a sequence without his or his fellows' interference and beyond their control; yet it seems that in the lowest stages of culture, as among the Eskimos, no comprehensive theory of the kind is conceived. Where we find, among primitive and ancient races, such a theory to exist, it may be explained either, as by the late Earl Crawford, as a traditionary and more or less corrupt survival of a Divine revelation, or, as in the speculations of the so-called "science" of religion, as man's earliest and unaided gropings after truth.

"There is a consensus of opinion that, before the present order of things, water held all things in solution" (Cheyne); but it is by no means clear that the earliest views imply the pre-existence of matter before the creative act. Though the Hebrew word for "create" did originally mean "carve," whatever may be the relation of the second verse in the Bible to the first, and though the interpretation of them as "creation out of nothing" may have originated late in the history of Jewish thought, we have more explicit statements in early Hindu literature. Though it is stated that in the Śatapatha Brāhmana of the White Yajur Veda, which dates at latest from the 12th century B.C., primeval waters and the world-egg produce Prajāpati, the Creator, Professor Wilson, a high authority, states that "the general tendency of the Vedas is to show that the substance as well as the form of all created beings was derived from the will of the Self-existing Cause." In this same Brāhmana we find the first mention of the curious myth that the world is supported on a tortoise, the tortoise on an elephant, the elephant on another tortoise, and so on. The Institutes of Manu (about 900 B.C.), though more mythological, are still distinctly monotheistic. "The Self-existing Power, having willed to produce various beings from his own Divine substance, first with a thought created the waters, and placed in them a productive seed" which became a golden world-egg in which the Supreme Being was Himself born as Brahmā, the Creator.

The world-egg, ridiculed by Aristophanes in the *Birds*, is a natural fancy common also to Phœnicia, Egypt, China, Polynesia, and Finland. The dome-like appearance of the sky might well suggest it, as the mud of a pool teeming with aquatic life might suggest the procreant nature of water. In both Phœnician and Egyptian cosmogony we seem to have the concept of sexual generation, at least as a simile. The deity is one, a spirit or wind which "makes pregnant" a chaos

black as night, which was represented in Phœnicia as a woman. In Egypt Ra, the sun-god or soul of the world, stirs the primeval waters of chaos with his divine breath (Chnum), and creates by a word, while Thoth, "the moon-god, is the tongue of Ra" or demiurge, the creative intelligence and light-giver. The Japanese, the Santals of Bengal, the Accadians and the Babylonians agree in having a primitive deluge; but the concept of repeated cataclysms (q.v.), alternating flood and ecpyrosis, belongs to a later and more philosohpically speculative age.

It is unnecessary to do more than allude to the absence of the extravagance of materialistic mythic fancy from the narrative in Genesis. The idea of sex is also absent. The spirit or breath of God hovered over the flood (masculine) . . . and God said, Let there be light.

The cosmogony resulting from the conclusions of modern science has, if the First Cause be excluded, no more satisfactory basis than the Hindu chain of tortoises and elephants. Matter, we are told, because indestructible by us, is eternal, though only manifesting itself by the energy it exhibits. Our so-called chemical elements may be derived from one primitive element, and throughout the universe we have movement, of unknown origin, resulting in a steady dissipation of energy (q.v.). [CREATION.]

Cosmos (Greek *kosmos*, literally *order*, hence the world as a system). the universe, the whole framework of visible things, including all the phenomena of nature of which the senses of man can take cognisance, and sometimes also used to include those which he imagines.

Cosquin, EMMANUEL (b. 1841), a French student of folk-lore. He was born, educated, and lived at Vitry-le-François, in the department of the Marne. He has written much in Catholic papers and magazines. His contribution to folk-lore has been the publication of *Popular Tales of Lorraine* (2 vols., 1886), and his theory is that most of such stories have been brought in much their present form from India within the historic period.

Cossacks (KOZAKS, KAZAKS). The Turkish word Kazak, meaning robber, marauder, was originally applied to any predatory peoples, as to the Circassians in the 10th century, and still to the Kirghiz Nomads of West Siberia. Bands of Kazaks (pronounced Kossak in Russian) begin to be heard of on the Lower Don about 1520, and soon after are found established about the rapids of the Dnieper, hence known as Zaporogues ("beyond the Falls") by the Russians. Originally Tatars, they were soon joined by such numbers of Poles and Little Russians that the Tatar element became completely absorbed in the Slav, and all the populations now known as Cossacks are essentially Russians in features, language, religion, and national sentiment. The Zaporogues long served as a rampart against the Mohammedan Tatars, who still held the Crimea and the northern shores of the Black Sea. They first received a regular military organisation under a *hetman* or *ataman* (German *hauptmann*, headman) from the Polish king, Stephen Batori (1575–87), and their settlements now gradually spread to the Don, the Sea of Azov, and the Kuban Valley, whence the "Don Cossacks" and the "Black Sea Cossacks" (Chernomorskii) of Russian history. Later their outposts appeared in the Terek valley, on the Lower Volga, and in the Ural Mountains, and it was the Cossack Yermak who overthrew the Tatar kingdom of Sibir (Siberia), and overran a great part of that region before the close of the 16th century. The Cossack military organisation has been carefully preserved and improved by the Russian government, and for the last hundred years utilised especially in border warfare and in advancing the frontiers of the empire towards China, Persia, and Turkey. At present the Cossack communities (Don, Black Sea, Volga, Orenburg, Urals, Siberia) have a collective population of about 2,000,000, of whom all the men between 18 and 50 are held to military service, exclusively as cavalry, receiving in return free grants of lands and other privileges.

Costa, SIR MICHAEL (1810–1884), musical conductor and composer, born at Naples, and educated at the Academy there. He composed from 1825–29, and coming to England composed a ballet, *Kenilworth*, in 1831. In 1832 he became conductor at the King's theatre, and later to Covent Garden, the Philharmonic Society, and the Sacred Harmonic Society. In 1855 he produced the oratorio *Eli* at Birmingham, where, too, he produced *Naaman* in 1864. From 1857–77 he conducted at the Handel Festivals, and in 1871 he became director of Her Majesty's opera. He was knighted in 1869. Besides his oratorios and other works, he has composed some operas; but it is as a conductor that he is chiefly known.

Costæ, the longitudinal ridges running down the outer side of a coral: they represent the continuations of the septa external to the wall or theca. They usually correspond in number to the septa, but are often less numerous. In compound corals the costæ may either end off in the intermediate calcareous tissue (or cœnenchyma), or the corallites (q.v.) may be united together by the costæ. [For terms *see* CORAL.]

Costa Rica, the southernmost of the republics of Central America, extends from sea to sea, and from Colombia to Nicaragua. It contains six provinces, and has an area of 20,000 square miles. The white men of the country are mostly of pure Spanish descent. The country is mountainous, and has many volcanoes—none above 12,000 feet high. The Atlantic side is covered with forests, but on the Pacific slopes savannahs prevail. The climate is mild and temperate, and the land is fertile and rich in minerals—gold, silver, copper, and others. There is some agriculture, but the population is scanty, and not more than $\frac{1}{20}$th of the country is under cultivation. The chief production of the country is coffee, for the growth of which the soil is eminently fitted. It also produces good timber and dyewoods, which it exports together with sugar, caoutchouc, hides, sarsaparilla, and tortoise-shell. The imports are principally grain and manufactured goods. The chief ports are Punta Arenas and Limon, the latter of which is connected

by a railway 118 miles long with San José, the capital. San José was much damaged by an earthquake in 1888. The government is carried on by a president and congress elected every four years, and there is a small standing army of 500 men, and a militia of 15,000. The Catholic religion is established, but religious freedom is guaranteed. The revenue is chiefly derived from a monopoly of spirits and tobacco.

Costello, Louisa Stuart (1799 – 1870), an English authoress. She was originally a miniature painter, and was patronised by the Burdetts. Her first literary production was a collection of poems in 1816. In 1825 she published another collection, illuminated by herself and her brother. Her *Specimens of Early French Poetry* (1835) brought her the friendship of Moore and Sir Walter Scott. But she is chiefly remembered for her bright description of travel in many parts, and some semi-historical novels. In 1852 she received a small Civil List pension.

Coster, properly Laurens Janszoon (about 1370–1440), said by the Dutch to have invented printing. He was born at Haarlem, where he passed his life, and died of the plague. A controversy as to the respective claims of Coster and Gutenberg to the invention of printing is not yet finally settled.

Costiveness. [Constipation.]

Costs, in the technical sense of the word, are the expenses incurred by parties in legal proceedings. Particular importance attaches to the principle and practice of costs, since, though in themselves incidental and subordinate to the main cause of action or suit, it often happens that they become a chief object of contention. *Costs between solicitor and client* are those which the client always has to pay his solicitor whether such client be successful or otherwise, and over and above what the solicitor gets from the opposing party in case of such party having lost the action. *Costs as between party and party* are those which the defeated party has to pay to the successful party, as a matter of course. Costs of and incident to all proceedings in the High Court are now in the discretion of the court, but there is a saving for the right of a trustee, mortgagee, or other person to costs out of a particular estate or fund, and it is also provided that where any action is tried by a jury, the costs shall follow the event unless the judge by whom such action is tried or the court shall, for good cause, otherwise order. Costs of any kind are subject to taxation by appointed officers. As regards costs between solicitor and client, if more than a sixth of the amount of the bill be taken off, the solicitor has to pay the whole costs of such taxation. [Taxation.]

Cosway, Richard, R.A. (1740–1821), an English miniature painter, born at Tiverton. He showed early talent, and his father—master of Tiverton school—sent him to London, where he studied under Hudson, and at the Royal Academy. He became A.R.A. in 1770, and R.A. in the following year. In oils he took Correggio as his model, but it was miniature painting that brought his fame. He was appointed painter-in-ordinary to the Prince of Wales, and painted Mrs. FitzHerbert and others of the Prince's circle.

Côte d'Or, a department of E. France, forming part of the old province of Burgundy, having an area of 3,380 square miles. A chain of hills linking the Cevennes and Vosges mountains, and separating the basins of the Seine and Saône, traverse the department. The special Côte d'Or, renowned for its wines, lies S. of the capital—Dijon. There is much forest and good pasture with fertile valley and plain. The department is drained by the upper Seine, with its tributaries, the Saône and the Arroux. It is connected with all the surrounding seas by a system of canals, the Burgundy Canal connecting Saône and Yonne. The climate is temperate, and the soil stony and rich. Among the minerals are coal, iron, gypsum, marble, and lithographic stone. There are several manufactures, and horses, cattle, and sheep are reared.

Cotentin, The, a peninsula in the N.W. of Normandy, jutting into the English Channel between St. Michael's Bay and the Gulf of Carentan. It is in the department La Manche, and is 55 miles long by 25 broad. There were many baronies and abbeys here under the Dukes of Normandy, and many Norman names now naturalised in England have their originals in this district. The land is fertile, and there are abundant flocks and herds. The old capital is Coutances, but the most important town is Cherbourg.

Cotes, Roger (1682–1716), an English mathematician, much esteemed by Sir Isaac Newton, who, on behalf of science, lamented his early death. He was born at Burbage, near Leicester, and educated at St. Paul's and at Trinity College, Cambridge, of which he became Fellow in 1705. In 1706 he was appointed Professor of Astronomy and Natural Philosophy, and took orders. His chief work was a preface to Newton's *Principia*. Many of his papers on pure mathematics were published after his death.

Côtes du Nord, a French department of Brittany with some neighbouring islands, having an area of 2,659 square miles. The Menez Mountains traverse the department from E. to W., and are about 16 miles broad with a maximum height of just over 1,000 feet. The soil is principally granite and clay-slate, and the rivers are short but navigable. There is much heath and wood, with many fertile tracts. Flax and hemp are grown in the hilly parts, where are also good pastures, and iron is found there. In the lowlands, grain, pears, and apples and other fruit are grown, and horses, cattle, sheep, and goats are reared. The capital is St. Brieuc.

Cotgrave, Randle (early seventeenth century), an English writer, born in Cheshire, and educated at St. John's College, Cambridge, of which he was Fellow in 1578. He was secretary to William Cecil, Lord Burleigh. He published a Dictionary of the French language in 1611, which is valuable

as giving some ancient and now obsolete words, and also as showing the forms and mode of spelling then in use. The second edition was published (1632) during his life. Many revised editions of the Dictionary have appeared.

Cotillon (fr. French for *petticoat*), originally a dance in which two, or eight, or more performers figured. It was the forerunner of the quadrille. In some ball-rooms of modern times the cotillon has been made the occasion of a senseless, lavish, and ostentatious display of wealth.

Cotingidæ, a family of Passerine birds, with nearly 100 species, chiefly from the equatorial forest region of the Amazon. Many of the forms are extremely beautiful, *e.g.* the Pompadour, the Bell-bird, the Cock of the Rock, the Umbrella-bird, etc. Some authors use the trivial name "Chatterers" for this family, others apply it to the Ampelidæ.

Cotman, John Sell (1782–1842), an English painter, born at Norwich, and educated at the grammar school there. He came to London, where he made the acquaintance of Turner. In 1807 he was teaching drawing and doing art-work at Norwich. In 1834 he was appointed drawing-master in King's College, London. His water-colour landscapes are gaining in reputation, and some consider him the best of the "Norwich school" of painters.

Cotoneaster, a small genus of shrubs and small trees belonging to the order *Rosaceæ* and natives of the northern hemisphere. They have small, simple, entire, leathery leaves, sometimes evergreen, with deciduous stipules; small white or pink flowers; and a small, scarlet, or less commonly black, pomaceous fruit with a bony core of from two to five carpels which partly project at its apex. One species, *C. vulgaris*, grows wild on the limestone cliffs of Great Orme's Head, Carnarvonshire, and several others are cultivated, especially for their ornamental clusters of scarlet fruits which remain long on the bush.

Cotopaxi, a volcano of the Eastern Andes, in the republic of Ecuador, 35 miles S.E. of Quito. It is the loftiest active volcano in the world, being nearly 20,000 feet high, the valley, however, from which it rises being 9,000 feet above sea-level. The upper part is a snow-covered cone of 4,400 feet, the verge of the crater having a parapet of bare rock. Below the snow lies a barren zone, succeeded by a space of moss and lichen, below which come forests. The general signs of volcanic action are smoke, explosions, and nightly glow. When eruptions take place there is but slight flow of lava, but flames, smoke, and clouds of ashes. The melting of the snow sometimes causes floods. There was an eruption in 1533, followed by others at irregular intervals until the great one of 1768, when the ashes were carried 130 miles. There were others in 1851 and in 1854-5-6. In 1803 Humboldt heard the noise at a distance of 160 miles. Humboldt thought the peak could never be scaled, but the top has several times been reached, by Whymper among others.

Cotswold Hills, an oolitic limestone ridge that passes through Gloucestershire from N.E. to S.W., from Chipping Camden by way of Cheltenham and Stroud to near Bath. It is 50 miles long, with an average height of 500 to 600 feet. The highest point is Cleeve Hill, 1,134 feet. The hills separate the Lower Severn from the sources of the Thames.

Cotta, Bernhard, German geologist, was born at Little Gilbach in 1808, and after studying at Freiberg in Saxony from 1827 to 1831 obtained a professorship in that town in 1842. He died in 1879.

Cotta, Johann Friedrich Freiherr, publisher, was born in 1764 at Stuttgart, studying first at Tubingen and then at Paris. In 1787 he devoted himself to business, and originated numerous successful publications, and formed the acquaintance of the leading literary men of the day, including Göethe, Schiller, Humboldt, etc., whose works he published. He became vice-president of the Wurtemberg Chamber of Deputies, and in 1815 was the representative of the Booksellers' Corporation at the Vienna Congress. He died in 1832.

Cottbus, a town of Brandenburg in Prussia, on the right bank of the Spree, 43 miles S.S.W. of Frankfurt. It is a walled town, with fine public buildings and extensive manufactures of woollens, linen, hosiery, and tobacco, and a flourishing export trade.

Cottin, Sophie Ristaud, authoress, was born at Tonneins in 1773, and in 1790 married a Parisian banker. Left a widow in early life, she published several successful romances, including *Elizabeth, ou les Exilés de Sibérie*, *La Prise de Jericho*, *Claire d'Albe*, and *Malvina*. She died in 1807.

Cottle, Joseph, publisher and author, born in 1770, settled in business in Bristol in 1791, and there formed a friendship with the "Lake" poets, whose works he published on generous terms. He retired from business in 1799, and was the author of *Recollections of Coleridge*, severely criticised, and several obsolete works. He died in 1853.

Cotton, the hairs on the testa or outer coat of the seed of various species of *Gossypium*. *Gossypium* is a small genus of *Malvaceæ*, including some twenty or thirty species, natives of the warmer parts of both hemispheres, three of which yield all the cotton of commerce. They are all perennial plants, though outside the tropics they practically become annuals. They have, scattered, three to five-lobed leaves, which are cordate in *G. barbadense*, round-based in the eastern species. The flowers are usually large and showy, being, in a wild state, yellow with a red centre in *G. barbadense* and *G. herbaceum*, pink with a red centre in *G. arboreum*. The seed in *G. barbadense* is sometimes black and has only long hairs upon it, whilst those of the eastern species have commonly also a down of short hairs. The hairs, which are unicellular, and are practically pure cellulose (q.v.), are from an inch to an inch and three-quarters in length, and the seed itself contains a considerable quantity (30 gallons to the ton) of a bland

non-drying oil which is used in a crude state in soap-making and instead of linseed oil, and, when refined, as an adulterant of olive oil. The refuse cake is valuable as a cattle-food. *G. arboreum*, a native of tropical Africa, has thick glossy dark green leaves, and its cotton is always white. It is grown near temples in India, to supply the triple sacerdotal thread of the Brahmans. *G. herbaceum*, apparently wild in India, with very hairy leaves, is not only the chief source of Indian cottons or "Surats," but is now also the commonest in Europe and the United States, and the sole species of China and Central Asia. In a wild state the cotton in this species is yellow. All native American cottons may be united as *G. barbadense*, which may have yellow or white cotton and either black, green, grey, or white seeds. The plant in the three last-mentioned forms is covered with hairs. The most valuable variety is the Sea Island, having a fine, soft, silky "staple" as the hairs are termed, exceeding other kinds in length. Introduced from the Bahamas in 1785, it is grown on the islands and low coast of Georgia and South Carolina, and has been introduced into Queensland, Egypt, and Fiji. Other much grown American varieties are known as Uplands, New Orleans, and Boweds or short-staple cottons.

Sanscrit records carry back the use of cotton to 800 B.C., and it may have been equally long known in Nineveh and Egypt. Its cultivation was introduced into Spain by the Moors. When America was discovered cotton was found to be grown and used from Mexico and the West Indies to Peru and Brazil. The earliest known European manufacture of cotton goods seems to have been at Venice and Milan about the middle of the 16th century. Hence it soon spread to the Netherlands, from which country it was brought to Bolton and Manchester by Protestant refugees about the close of that century. Before the inventions of Hargreaves, Arkwright, and Crompton, it was only a domestic manufacture; cotton could only be used for the weft of the cloth; and our supplies of raw cotton were obtained from Southern Europe, the Levant, the West Indies, and Brazil. About 1770, planters in the Southern United States turned their attention to cotton, and they exported 138,000 lbs. in 1792, and nearly 18 million lbs. in 1800. England's total imports of raw cotton in 1751 were under 3 million lbs., but in 1800 they exceeded 56 millions. In 1888 the United States exported cotton to the value of over 46 millions sterling, of which over 31 million pounds' worth came to Britain, and our total import of raw cotton was valued at 40 millions and our exports manufactured and raw at nearly 72 million pounds. Besides the United States, Egypt, India, and Brazil are now our chief sources of supply. The total cotton production of the world is now estimated at 1,700,000 tons annually, of which the United States produces two-thirds and India one-eighth.

The cotton harvest in America is from August to December. The cotton, when picked and dried, is separated from the seeds, about two-thirds of its bulk, by a process called "ginning," the two chief types of machine used being the *saw-gin* and the *roller-gin*, the former for short staple, the latter for long. It is then packed in bales of 400 to 500 lb. weight. Successive mechanical inventions having made what was once the product mainly of labour almost entirely one of capital, Great Britain, with her supplies of coal, has been able to furnish the world with most of a commodity once brought from India, to make it an article of universal use and to hold her monopoly against all her rivals. In 1764 James Hargreaves (q.v.) invented the spinning jenny; in 1769 Richard Arkwright (q.v.) invented the spinning frame or throstle, which he supplemented with various contrivances for "opening," "scutching," and "lapping" the cotton; and in 1775 Samuel Crompton invented the "mule." Whereas formerly each spindle required one man's attention, a man can now work 2,000 spindles, and England employs more than 45,000,000 spindles, more than all the other countries of Europe together. The capital invested in the cotton trade in the United Kingdom is probably £100,000,000, and probably over two million people are employed in it. In 1850 we exported over 1,000 million yards of cotton cloth; in 1860, over 2,000; in 1870, over 3,000; in 1880, over 4,000; and in 1890, over 5,000 million yards. Four-fifths of these exports go from Liverpool; whilst Glasgow practically monopolises the trade in Scotland, Paisley, however, producing a greater quantity of cotton sewing-thread than all the rest of the United Kingdom. The manufacture of cotton in India is growing rapidly, though the first steam mill only began work in 1854. In 1889 there were 124 mills, with 2,763,000 spindles, employing over 91,000 hands, and Bombay has almost wrested the Chinese and Japanese market from Manchester. India is still, however, our chief customer for manufactured cotton.

Cotton, BARTHOLOMEW DE, historian and a monk of Norwich, was the author of a work entitled *Historia Anglicana*, in three volumes, a plagiarism of the productions of earlier writers. He died about 1298.

Cotton, CHARLES, poet, was born in 1630 at Beresford, Staffordshire, and was a friend of Isaak Walton. He devoted himself early in life to literary pursuits, in which, though a staunch Royalist, he was in no way interrupted. In 1656 he married his cousin Isabella, daughter of Sir Thomas Hutchinson. No collection of his poems was published until after his death in 1687. Though constantly in pecuniary difficulties, he was both a vigorous and prolific writer. His best known works are his *Scarronides*, or *The First Book of Virgil Travestic*, published in 1664, and his translation of *Montaigne's Essays*, issued in 1685.

Cotton, SIR CHARLES, a British admiral, was born in 1753, and became a commander in 1779, and a captain in the same year. He commanded the *Majestic*, 74, on "the Glorious First of June," 1794, and the *Mars*, 74, in Cornwallis's celebrated retreat. He became a flag-officer in 1797, and was thenceforward for nearly eight years employed in the Channel. In 1807 he accepted the command at Lisbon, and greatly assisted in rendering possible

the victories of Sir Arthur Wellesley at Rolica and Vimiera. He refused his signature to the Convention of Cintra, and made a separate convention with the Russian admiral who was then in the Tagus. The result was that the Russian squadron was delivered up to Sir Charles. In 1810 Admiral Cotton succeeded Lord Collingwood as commander-in-chief in the Mediterranean. In 1811 he was transferred to the Channel, but he held that command for less than a year, dying at Plymouth on February 23rd, 1812.

Cotton, George Edward Lynch, D.D., Bishop of Calcutta, was born at Chester in 1813, studied at Westminster School and Cambridge, and held a mastership under Dr. Arnold at Rugby. As headmaster of Marlborough College from 1852 to 1857, he succeeded in materially raising the tone of the school, and in 1858 was appointed to the see of Calcutta, where he worked zealously till his death by drowning in 1866.

Cotton, Sir Robert Bruce, baronet, antiquary, was born at Denton, Huntingdonshire. in 1570, and educated at Westminster School and Cambridge. Coming to London, he devoted his time to antiquarian research, collecting books, coins, etc., and rendering assistance to his friend Camden in the compilation of his work *Britannia*. Cotton House soon became a favourite resort for literary men, and as a member of the Antiquarian Society he made, about 1590, the acquaintance of Selden, Sir John Davies, and other scholars, and was created a baronet in 1611. His attachment to the popular party and certain of his publications, notably *A Proposition for His Majesty's Service to Bridle the Impertinence of Parliament*, ultimately were the cause of his imprisonment and the confiscation of his library. He died broken-hearted in 1631.

Cotton Sedge, a more accurate name for the genus *Eriophorum*, often called Cotton-grass, but belonging to the order Cyperaceæ. It comprises about a dozen species, natives of North Temperate and Arctic regions, growing as perennial herbs mostly in bogs. The stem is often three-angled, as is also the fruit: the leaves are three-ranked; and the flowers, which are clustered in spikelets, are in the axils of imbricate glumes, are bisexual, and have four or more bristles round them in place of a perianth. These bristles afterwards elongate into long silky hairs, so as to form a tuft like the "lint" of cotton. Though not capable of being woven, not worth cultivation, and somewhat inaccessible to the gatherer, these tufts are used, under the name "Arctic Wool," for stuffing cushions.

Cotton Spinning. A distaff and spindle, when cotton was spun by hand, in course of time gave place to the spinning wheel, either plain or of the Saxony pattern which had a flyer attached to its spindle. In 1764 James Hargreaves, a poor weaver of Hanhill, Lancashire, invented his "spinning jenny," which combined the movement of the wheel with a travelling carriage. But his machine was superseded in 1769 by that of Richard Arkwright, a man who, originally a Derbyshire barber, died a rich knight. He projected with Kay, a clockmaker, the "water frame," which was in principle a continuous spinning wheel. It dispensed with Hargreaves' travelling carriage, but added drawing rollers. Six years later Samuel Crompton, an ingenious weaver of Bolton-le-Moors, began the construction of his "mule," so called because he united the travelling carriage of Hargreaves with the drawing rollers of Arkwright. Arkwright's principle is perpetuated in the throstle and ring spinning, but Crompton's hand-worked machine, with the carriage and intermittent motion, was the prototype of the present day self-acting mule. One other point in the history of cotton spinning is of special interest. The largest weaving and spinning factories in the empire are to be found in what Dr. Taylor described as a "secluded nook," which forty years ago was almost open country, where Lancashire, Yorkshire, and Cheshire all meet. Here the power-loom driven from West Houghton found refuge, in consequence of the obstacles raised by the operatives to its introduction elsewhere.

Cotton is received from America, Egypt, India, Peru, or Brazil in bales covered with coarse sacking and bound with hoops of iron. Liverpool is the great cotton market. In a Lancashire mill, in the mixing room, it is opened out. Abroad the process of "ginning" has to some extent separated from it the fibre and the seed, but much foreign material, dirt, and sometimes large stones remain to be removed. As they are pulled apart into pieces, the bales are mixed according to the quality of the yarn required, for the best all American being used. The larger the mixing the better, for one of the fundamental rules of cotton spinning is to secure uniformity, evenness, and regularity. One reel of cotton may indeed be composed of filaments from innumerable plants. A handful of raw cotton, on examination, will be found to consist of a number of fibres, matted together, and entangled one with the other. These fibres in the lowest quality cotton (East Indian) will average $\frac{3}{4}$ inch staple, and the best will measure $1\frac{1}{8}$ inch in length. A staple may be broken, but the one fibre will cling at one end to another, if the two are parallel. The loose cotton is stacked, and quantities are taken from the sides of the pile just as hay is, and they are conveyed on an endless lattice frame or "creeper" to an opening machine, and afterwards to a scutcher, or to a combined opener and scutcher, which takes out dirt and impurities from the cotton by bringing it into contact with beaters, finally delivering the material between cylinders in the form of a "lap," rolled upon a bobbin. Strong draughts blow away the dust; the process is, therefore, sometimes called "blowing." Five of the laps, resembling rolls of wadding, are fed into a finishing scutcher, further to purify the cotton and to attain the desired regularity, and from this machine one large lap emerges ready for the Carding Engine. in which it will be again cleansed. To this stage the fibres are still matted together, and lie in confusion, but the machine secures a beautiful and orderly arrangement of them. At one end of the machine the flat web from the

scutcher is drawn in, and at the other a fine gossamer film, or "sliver," issues, coiling itself automatically in a can placed to receive it. The fibres have, in passing between large and small rollers and "clearers" working on a cylinder, revolving at 165 revolutions per minute, been combed out, and laid parallel by means of the wire teeth, with which the opposing surfaces of the rollers are covered. Two forms of carding engines are in use —the "roller and clearer" and the more modern machine, which presents to the cotton a series of jointed flat cards as they revolve round the cylinder.

The cans of ribbon-like slivers are now taken to a drawing frame, in which, again to ensure strength and regularity, a number of the skeins will be united into one by what is known as a "finger and thumb" movement. Six slivers are led between pairs of rollers, and the front pair travels six times faster than the back pair, the result being that the cotton is drawn out correspondingly; and is then coiled once more into a can. Six of these slivers are removed to the next "head," and the process is repeated. A third time the combination of six is made and the sliver drawn out, so that it now contains within itself $6 \times 6 \times 6 = 216$ slivers. Should one of these slivers break the machine stops instantly. The drawing frame initiates the cotton to a prolonged series of drawings and doublings. No twist has, however, yet been imparted to the cotton, the filaments having been simply drawn out, and placed as parallel as possible. In the next machine, the slubbing frame, the cotton receives its first twist which enables it to be drawn out still finer. The slubbing frame has four separate motions, each working in conjunction with the other. (1) A roller motion for drawing out the sliver; (2) a spindle for giving the twist; (3) a bobbin for winding the sliver; and (4) a lifting motion which raises the bobbin up and down in order that it may be properly filled. The cotton wound upon the bobbins is removed to the intermediate frame, which unites the contents of two bobbins into one, the cotton being made finer and more rounded, giving this time in the result a combination of 432 of the original slivers. All these "fly frames" resemble each other in mechanism, the difference being in the varying arrangement of the rollers to give out a fixed quantity of sliver, and to impart the needful twist to the filaments. In winding the roving upon the bobbin it is necessary to adapt the motion to the shape of the cone. This does not seem a difficult matter, but, as an expert points out, "it involves the nicest calculations in mechanics; and is far too complex to be understood by the casual and unscientific observer. It is accomplished by an ingenious arrangement of wheels working with differential movements, in conjunction with a pair of cones which give compensating effects as the roving assumes the cone shape on the bobbin." Next the cotton is dealt with by the jack or roving frame which completes the work of preparation, and as another doubling takes place the number of the original carding slivers in the roving now stands at 864. The roving is weighed and tested to ascertain whether it is in accordance with the count which has to be spun. By the "count" is meant the degree of fineness. Cotton-yarn, if wound into hanks from the cop, contains 840 yards in each hank, and the count indicates the number of these hanks to a pound weight of yarn. Some spinners produce 220 hanks to the pound, that is to say, 220×840 yards of yarn $= 184{,}800$ yards.

Roving is converted into yarn by the spinning machines, sometimes by throstle and ring, which have a continuous motion instead of the intermittent one, which is one characteristic of the self-acting mules; and also dispense with the travelling carriage. A mule is a wonderful machine to behold. A pair of mules face each other, and they are in charge of a minder and a boy "piecer." Both man and boy work barefooted in the hot room, a temperature of 90° being necessary to keep certain parts of the machinery—sheep-skin covered rollers—in a condition to prevent the cotton from adhering to them. There may be as many as 1,296 spindles to each mule, and these are ranged in one long line upon a travelling carriage or frame, which runs outwards on wheels a space of 64 inches every quarter of a minute and then returns upon its little tramway. At the back of each mule are placed the bobbins of rovings in creels. Below them on the beam or fixed part of the machine are pairs of rollers which bring about more doubling by uniting the contents of two bobbins into one and drawing them out together to the required length. When the travelling carriage is nearest to the bobbins the roving is attached to the spindles, which, as the journey outwards is begun, revolve at the rate of 10,000 revolutions per minute. The yarn is drawn out as the carriage moves away, the spindles meanwhile giving the twist to the strands. Then for a moment the carriage stops, the spindles cease to rotate, and the rollers to give out rovings. The spindles then "back off" by unwinding the thread attached to them. As the carriage returns to the frame the yarn, by a kind of wire finger, termed a "faller," is wound round the spindles in the form of a cone, which is called a "cop." It may take several journeys to complete the cop, but when this is done the machine stops, and the spindles are cleared and started again with a fresh supply of roving. This is called "doffing." Obviously, during the progress of the work the slender threads are liable continually to break, and it is the duty of the piecer by a dexterous movement to unite the two ends. The piecing is done with incredible rapidity, for the moments available are limited, and quickness of eye and of hand is necessary. Underneath the machine is a piece of woollen cloth brushing over the plate beneath for cleansing purposes. Simple as it is this contrivance has been the means of saving many lives, formerly sacrificed when the work had to be done by boys. The largest mill in Lancashire contains 112,000 spindles.

Warp and weft yarns are spun by these mules—the warp having a harder twist given to it than the weft. In each thread wound upon the cop we see the combined result of 1,728 of the filmy ribbons which came from the carding engine. Supposing the count to have been 60's, the pound of yarn

presenting the number would measure, we are told on the authority of some of the largest cotton spinners of the present day, 28¾ miles. The cops are taken to the weighing-in room, and afterwards to the warehouse until they have lost any brittleness caused by the high temperature in which they have been spun. Some "reel yarn" goes direct to dyers in Scotland, China, and India. The Scotch "doublers" unite two 40's, passing the thread through water to make it adhere. Yarn required for export is reeled into hanks on "swifts" by girls and divided into "lays" with string—seven lays of 120 yards making up the hank. Afterwards these hanks are loosely knotted and under steam pressure made into bundles, about 9 in. × 6 in., and from 5 to 10 lbs. in weight. Yarn for home use mostly remains in the cop, and passes into the hands of the weaver, to be made into cotton cloth.

In all the processes of cotton spinning there is unavoidable waste. It exists in the form of refuse from the blowing and scutching machines, and "fly" from the carding engines; in sweepings from the floors and in various other forms. Of 100 lbs. of raw cotton 10 lbs.. will be thrown off in these ways. Some of the finest portions disappear altogether in the atmosphere, and form what is described as "invisible" waste. A large quantity of that which is secured is sold to waste dealers, who sell it to manufacturers of low-class goods.

Cotton Wood, an American name for the rapidly growing wood of the various species of poplar, which are grown for firewood, paper-pulp, etc., and are so called from the cottony hairs on their seeds.

Cottus. [Bullhead.]

Cotyledon, from the Greek *kotuledon*, is the name applied to the embryonic or primary leaves of the higher plants. There is no such structure among mosses; but in ferns one portion of the embryo (q.v.), resulting from the division of the fertilised oosphere (q.v.), develops into a distinct leaf or cotyledon. In the yew and other gymnosperms (q.v.), as in most dicotyledonous angiosperms, there are two opposite simple cotyledons with the plumule (q.v.) or bud of the stems between them; but in *Pinus* and some other gymnosperms the cotyledons are so deeply lobed as to appear like many arranged in a whorl, and the gymnosperms have in consequence been termed *Polycotyledones*. In the class Monocotyledones (q.v.), as its name indicates, there is but one cotyledon, and it generally appears as if terminating the axis of the embryo. In exceptional dicotyledons, such as the oak, we may have three cotyledons, and in the parasitic genus *Cuscuta*, the dodder (q.v.), there is hardly a trace of any. In most plants the cotyledons are thick, fleshy, and colourless at first, serving as storehouses of food for the seedling. This is especially the case in those exalbuminous seeds in which they remain within the seed during germination (q.v.). The cellular tissue of the cotyledons may be oily, as in walnut and almond, or mealy, as in the bean; in many cases, as in the barberry and linden, veins are distinctly traceable in them; they may have petioles; and in *Pinus* they develop chlorophyll (q.v.) before germination. They may be of unequal size; and, though always turned towards the chalaza (q.v.), may be variously folded on themselves and with reference to the radicle. Thus they may be parallel, with the radicle against their edges, when they are called *accumbent;* or the radicle may rest against the flat side of one of them, when they are termed *incumbent*. Such characters are used to subdivide the order *Cruciferæ* (q.v.) into tribes. When in germination they rise above ground as the first green leaves they often differ much in shape from the foliage-leaves subsequently produced, as in the case of the seedling plants of mustard and cress, commonly eaten as salad.

Coucal, any bird of the genus Centropus, with thirty-five species, from Africa, the Oriental region, Australia, and Austro-Malaya. They are non-parasitic cuckoos, and are sometimes called Lark-heeled Cuckoos, because the hind toe is abnormally long.

Couchant, a term in heraldry applied to lions and other similar animals when lying down; but with the head raised. Deer and animals of that tribe are blazoned as "lodged."

Cougar, Couguar. [Puma.]

Cough. A cough consists of a preparatory inspiration, followed by a violent expiratory effort, during which the glottis at first closed is suddenly burst open by the imprisoned air, with the result that a certain noise is produced. Coughing may be due to the irritation caused by the lodgment of foreign bodies in the air passages, or to diseased conditions of the lungs, trachea, larynx, fauces, and, it is said, of the ear and stomach. These last-named parts of the body are supplied by the pneumogastric nerve, other branches of which are distributed to the lungs; and hence it is argued that an "ear cough" and a "stomach cough" furnish examples of irritation applied to one branch of a nerve being "referred" to another branch. The treatment of coughing depends upon the condition to which it is due, and will be discussed under the heads of the different diseases in which cough is a prominent symptom.

Coulomb (from Augustus de Coulomb, 1736–1806, an officer of engineers in the French army and a distinguished physicist), in *Electricity*, is the name given to the unit quantity of electricity. A current of one *ampère*, *i.e.* a unit current, flowing past any section of a conductor for a second, involves the displacement of one coulomb of electricity past the section in that time. A coulomb of electricity sent through a silver voltameter will deposit ·000010352 gramme of silver, however long it take to pass through; a small current flowing for a long period having the same effect as a large current flowing for a short interval.

Council, a meeting together for consultation, and also the body of persons so meeting. There are almost as many councils, therefore, as there are human interests that need mutual consultation. A special use of the word is to denote ecclesiastical

consultations, which may be diocesan, provincial, national, general, or œcumenical. Those only which were general or œcumenical are of permanent importance, the difference between them being that those only whose decisions have met with universal acceptance are called œcumenical. While the English Church only allows the first four general councils to be of binding authority, the Greek Church admits seven, from the 1st of Nicæa in 325 to the 7th of Nicæa in 787, and the Roman Church regards as authoritative, in addition to these, the five Lateran councils, the Council of Trent (1545–1563), and the Vatican Council which met at Rome in 1869, and whose session is not yet terminated. To be made a member of the Sovereign's Privy Council is one of the highest honours an English subject can receive, though in the majority of cases the appointment is only complimentary, since few are called upon to take part in deliberation.

Council Bluffs, a city of Iowa, the capital of Pottawattamie county, lies some three miles east of the Missouri river, and 317 miles west of Davenport. The chief manufactures are carriages, paper, iron, and agricultural implements. It is an important railway station, two lines from Chicago converging here to meet the Union Pacific railway at Omaha, on the opposite side of the Missouri.

Council of War, a council of subordinate officers summoned by a military or naval commander, to aid him with their advice on occasions of such importance or emergency as seem to him to call for the opinions of others to supplement the conclusions of his own judgment. The opinions of such councils are in no way binding upon the leader who summons them, nor do they free him from the weight of his own responsibility.

Counsel. [BARRISTER.]

Count (from Latin *comes*, companion) originally meant one associated in government with a superior. Under Constantine, and in the Lower Empire generally, the *comites* formed a kind of council of state, and the dignity might carry real power or be, as in most cases it was, merely complimentary. The *comites* of the early German kings are primarily their immediate associates in war, on whom they confer honours, wealth, and special privileges. Under the Frank kings the Count of the Palace ranked next to the Mayor of the Palace, and Counts Palatine had in their own jurisdiction many royal prerogatives till a comparatively late period. We have still a County Palatine in England, and it was not till last century that Durham lost its Bishop Palatine. Though the title of Count never took root in England, the earl's wife is called countess. The German *graf* is more equivalent to our earl, but there was a higher degree of grafdom which enjoyed many privileges, and whose members later received the title of prince. There are still counts of the Holy Roman Empire, who receive their rank from the Pope.

Counterbalance, in *Engineering*, a weight employed to counteract the effects of vibrating or eccentric parts of a machine.

Counter-irritants, substances which produce irritation, and which are applied to the skin or other accessible parts, with the object of affecting deep-lying and inaccessible structures. For example, a poultice or blister is applied to the chest to relieve inflammation of the lungs or pericardium. Counter-irritation may act partly by drawing blood to the surface and so relieving congestion in the inflamed part, but probably its effect is mainly brought about through the nervous system. [BLISTER.]

Counter-point, in *Music*, the art of adding to a melody one or more separate melodies, distinct in themselves from the original theme, but combining harmoniously with it. The rules of counterpoint are not so strictly observed in the present day as they used to be in the 16th century; but a knowledge of the art is, nevertheless, essential for every kind of polyphonic composition, and has been brought to great perfection by Mozart, Beethoven, and Wagner.

Countersinking means the letting-in of a screw-head or bolt-head so that it shall be flush with the surface to which it is fixed.

County, in England the equivalent of the old English *shire*—a division of the country for purposes of judicial and local government, and ranking next above the hundred, but often in modern times subdivided for parliamentary and other purposes. Of old the earl was the head of the county in many respects, while the Crown was represented by the sheriff, who presided at the shire moot. At present the principal county officers are eight in kind—Lord Lieutenant, Custos Rotulorum, Sheriff, Coroner, Justices of the Peace, Clerk of the Peace, County Treasurer, County Surveyor; and the earldom is quite dissociated from the idea of county government. Under an Act of 1888 County Councils have been formed for the local government of sixty administrative counties. There are special county rates, County Boroughs which are exempt from the Council's authority, and County Courts for small civil cases.

County Councils, the elective bodies established by the Local Government Act 1888 to manage certain specified administrative business of each county formerly managed by the Justices of the Peace (who are nominated by the Crown), in Quarter Sessions and other administrative business mentioned in the Act, and consisting of the chairman, aldermen, and councillors. The councillors are elected for separate electoral divisions under the "County Electors Act, 1888," the qualifications for electors being similar to that of burgesses in boroughs, with the addition that ministers of religion are not disqualified and that peers owning property in the county and persons registered as parliamentary voters in respect of the ownership of property in the county are qualified. They are elected for three years, and then retire together. The aldermen, who are termed "County Aldermen," are elected by the councillors. They are elected for six years, and half of the number retires every three years. The chairman is analogous to the

mayor in a borough council, and is elected by the council from among the aldermen or councillors or "persons qualified to be such." The administrative business transferred to the county councils from the justices of the peace consists of a great variety of county business formerly transacted by the justices of the peace for each county, and too lengthy to be here detailed.

County Courts, inferior tribunals for the administration of justice in civil claims. Established in England in 1846 by the Act known as the original "County Courts Act," the main provisions of which are now (under the above and amending statutes) as follows:—The area of the jurisdiction of each court is as fixed by Order in Council from time to time. The judges, who are appointed by the Lord Chancellor, and may not exceed sixty in number, must be barristers of at least seven years' standing, who must not practise at the bar, or act as arbitrators for any remuneration to themselves, and when permanently infirm and desirous of resigning, may receive pensions. The subject matter of the jurisdiction are all personal claims where not more than £50 is claimed, except libel, slander, seduction, or breach of promise of marriage, ejectment (where either the value of the lands or the rent exceeds £50 a year), and actions in which the title to any corporeal or incorporeal hereditaments, or to any toll, fair, market, or franchise, shall come in question. Also all actions by creditors or legatees of a deceased person or for execution of trusts, or for redemption of a mortgage, or for specific performance of an agreement for sale or lease of property, or under the Trustee Relief Acts or Trustee Acts, or relating to the maintenance of infants or for the dissolution of partnership, or for relief against fraud or mistake, provided that in each of these actions the subject-matter does not exceed in value the sum of £500. Also, by agreement of both parties, all actions assigned to the Queen's Bench Division of the High Courts. Actions of contract in the High Court, where not more than £100 is claimed, may be remitted to the County Court by a judge of the High Court for trial. The judge in the County Court is the sole judge of all questions, both of fact and law, but where the amount in dispute exceeds £5, or the action is of an equitable nature, either party may require a jury which consists of five persons. An appeal is allowed in cases where more than £20 is in dispute. If less than that, then only if the judge thinks such appeal "reasonable and proper." A considerable bankruptcy jurisdiction has of late years been conferred on the County Courts.

Coup, a French word meaning *stroke*, keeping its French pronunciation in English, and seldom employed except in phrases adopted bodily from French. Examples of its use are—*coup d'état*, a sudden stroke of policy, such as that of Napoleon III. when he made himself Emperor; a *coup d'œil*, a sudden comprehensive view, or the instantaneous optical effect of a scene; a *coup de théâtre*, a stage trick; a *coup de main*, a sudden and unexpected attack which disconcerts an adversary by its suddenness.

Couple, in dynamics, means a system of two forces of equal magnitude, acting in opposite directions in parallel lines.

Coupling Rod, in *Engineering*, is a bar of wrought-iron or steel joining corresponding points on wheels of equal size in such a way that it will always move parallel to itself, and will therefore transfer motion of the one to the other. In a locomotive it is necessary that the driving-wheels shall be sufficiently loaded to produce the requisite amount of friction between the tires and the rails. With a single pair of driving-wheels this may be difficult to effect, especially when the engine has to draw a heavy train. Hence the advantage of coupling the driving-wheels with another pair of equal size. This in effect means doubling the load on the driving-wheels.

Couplings, in *Engineering*, are the arrangements by which one piece of shafting may directly transmit its motion to another piece in the same line. *Flange-couplings* have two flanges, each firmly fixed to its piece of shafting, butting close against each other, and held together by bolts. One of the pieces may be arranged to slide along the shaft, so as to engage or disengage itself with the other.

Coupon (Fr. *couper*, to cut), that part of a bond, stock certificate, or security which is detachable from the main portion, and whose detachment only affects the main instrument so far as the coupon itself is concerned. Modern travel has made most of us acquainted with the compound railway ticket, whose coupons are detached at various stages of a journey, while the cover or main part is retained till the last stage. Theatre tickets sometimes have a coupon, which the ticket holder retains after giving the other part up.

Courbet, A. A. PROSPER, French admiral, born in 1827 at Abbeville, became a captain in 1873, and distinguished himself first as governor of New Caledonia, and, after attaining flag-rank, as naval commander-in-chief at Tonquin, especially by the capture of Soutay. He led the operations against China in 1884, and commanded the bombardment of Foochow on August 23rd. Less than a year later he died at the Peocadous Islands on June 11th, 1885. So highly did his countrymen estimate him that they at once named an ironclad after him.

Courbet, GUSTAVE, French painter, was born at Orleans in 1819, and studied law, but in 1839, on his arrival in Paris, devoted himself to art, in which he became the leader of the realistic school, which, throwing idealism aside, depicted nature as it really is. Totally illiterate, and an ardent revolutionist, he became in 1871 a member of the Commune. Among his best known works were *L'Après-dînée à Ornans* (1849), *Les Baigneuses* and *La Mer Orageuse*. He died in 1877.

Courbevoie, a town of France, on the Seine, in the department of the Seine, $5\frac{1}{2}$ miles N.W. of Paris, on the Paris and Versailles railway, contains several fine public and private buildings, and has a growing population.

Courier (Lat. *currere*, to run), literally a runner or messenger. In this sense the messengers of the Foreign Office who take dispatches and the like to a foreign court or to representatives abroad are called couriers ; but the name is more generally used to denote skilled attendants employed by travellers to lessen the embarrassment of travel by their knowledge of the language of the countries travelled through, and by their experience of the measures necessary for the travellers' comfort.

Courier, Paul Louis, French author and soldier, was born at Paris in 1772. He obtained a commission in the army, and served with distinction, but retired after being wounded at the battle of Wagram in 1809. A strong Republican, his political pamphlets of a very virulent character, directed against the Government of Louis XVIII., brought him into trouble in 1821, when, for a publication entitled *Le Simple Discours*, he was fined and imprisoned. He was assassinated in 1825. He is now chiefly remembered for his admirable prose style.

Courlan, the popular name of either of the two species of heron-like wading birds of the Neotropical genus Aramus (*A. giganteus* and *A. scolopaceus*). They were formerly classed with the Rails, but now constitute a family (Aramidæ).

Courland or **Kurland,** a government of Russia, capital Mittau, one of the Baltic provinces. It occupies an area of 10,535 square miles, and is bounded on the W. by the Baltic, on the N. by the Gulf of Riga, and on the N.E. by the river Dwina. The coast is flat and the surface undulating, with numerous lakes and marshes. Agriculture is the chief pursuit. Courland was incorporated with Russia in 1795. The original *inhabitants* of Courland were the Kûrs, a Finnish people akin to the Esthonians, but now extinct or absorbed in the surrounding populations. They are not to be confounded with the Kûrs (Kuren) who still occupy the shores of the *Kurische Nehrung*, but who are Aryans speaking a Lithuanian dialect. At present the great bulk of the people are Letts, also a branch of the Lithuanian family, numbering about half a million. The other elements are Russians (50,000), Germans (60,000), Jews (30,000), Poles (12,000), Livonians, Gypsies, and sundries (10,000).

Course. In navigation, the point of the compass on which a ship should be kept steering, or the angle which a ship's track makes with the meridian. The principal sails, *i.e.* the mainsail, foresail, mizzen, and sometimes also the mizzen-staysail, fore-staysail, and (in brigs and schooners) the main-staysails of a ship are usually distinguished as "courses."

Coursing as now understood is the hunting of hares by a brace of greyhounds. The sport may be carried on in open country, which seems the truer kind of sport, or in an enclosed space, where, although the performance of the greyhounds may be easily judged, the quarry gets no chance of escape, and so the charge of unsportsmanlike practice may be urged as it is in the case of battue shooting. It is more particularly against this form of coursing that an outcry upon the score of cruelty has of late been raised. The judge at a coursing meeting has many points by which to decide the merits of the greyhound, the general principle being that not necessarily the dog that kills the hare is the winner, but the dog whose efforts most evidently lead to its being killed. The most noted meeting of the year is that in which the Waterloo Cup is competed for at Altcar in Lancashire. Open meetings often take place upon downs, though Plumpton, which is on the South Downs, has the doubtful honour of having inaugurated closed meetings. Kempton Park, and Wye, near Ashford, in Kent, have also noted meetings.

Court, an enclosed place, used metaphorically in many senses, for example a court of law, a court of honour, the court of a sovereign. To be presented at Court is to be presented to the sovereign on some ceremonial occasion such as a levee or a drawing room. It is a privilege which has much value for some people, and, as it confers certain rights, it is not lightly granted, and may be cancelled, so far as the rights pertaining to it are concerned. It is probably from association with the idea of a royal Court and the manners and customs which characterise it, that has come the verb *to court* in the sense of paying particular attention and respect to a person generally with the object of obtaining some favour.

Court Martial, Naval, a court composed of admirals, captains, and commanders for the trial of offences against the Articles of War, as prescribed by various Acts beginning with one of the 22nd of George II. Such courts are held in the forenoon and are public ; and post-captains of all ships present in company have a right to assist. The sentence, unless it be a capital one, requires no confirmation, but the Lords of the Admiralty can suspend, modify, or annul it. Naval courts-martial are of great antiquity, and the record of one held by Sir Francis Drake is preserved.

Court of Sessions. [Sessions, Courts of.]

Courtney, Leonard Henry, statesman, was born at Penzance in 1832, and educated at St. John's College, Cambridge. He was second wrangler and first Smith's prizeman, and in 1858 was called to the bar, and elected to the chair of Political Economy at University College, London, in 1872. In 1876 he was returned as Liberal member for Liskeard, became Under-Secretary of State in 1880, Under-Secretary for the Colonies in 1881, and Financial Secretary to the Treasury in 1882, and in 1885 was returned for the south-east division of Cornwall. He is a champion of women's rights and minority representation, and a Liberal Unionist. He was chairman of committees in the Parliaments of 1885 and 1886.

Courtrai, a fortified town of Belgium in West Flanders, on the Lys, 26 miles south-west of Ghent. It possesses numerous fine public buildings, including a famous belfry. Its manufactures consist

of linen and cotton fabrics, damasks, lace, yarn, woollen goods, tobacco paper, leather, etc. It is famous as the scene of the battle of the Spurs in 1302.

Cousin, VICTOR, philosopher (1792–1867), was born at Paris, and educated at the Lycée Charlemagne and the École Normale. Fascinated by the lectures of Laromiguière and Royer Collard, he turned his attention almost entirely to philosophical and metaphysical research, becoming in 1815 professor of philosophy at the Sorbonne. Deprived of this post on account of the advanced liberalism of some of his lectures, in 1824 he paid his second visit to Germany, and was imprisoned at Berlin for six months for over-freedom of speech, employing his time in the perusal of German philosophical works. He held office under the government of Louis Philippe, and after an official visit to Germany to inquire into the methods of education there, was created a peer of France soon after his return. As Minister of Public Instruction in 1840 he proved almost a silent member, and after the revolution of 1848 entirely devoted himself to study and writing. His philosophy was eclectic, in its nature spiritualistic, and directly opposed to the sensualistic philosophy of the preceding century. It was based largely on that of Reid and Dugald Stewart, and owed much to Hegel. According to his theory no system was complete, though some truth might be found in all. A complete system could only be formulated by an amalgamation of all that was noblest and best in the different systems into one composite whole. Among his principal works are his translation of Plato, *Du Vrai, du Beau et du Bien*, and his *Histoire Générale de la Philosophie.*

Cousins, SAMUEL, mezzotint engraver, was born in Exeter in 1801, and became a pupil of S. W. Reynolds. Taking an establishment of his own in 1818, in 1826 he visited Brussels, became an A.R.A. in 1835, and an R.A. in 1855. In 1874 he purposed retiring, but continued to work at his profession till 1883, his death occurring in 1887. His engravings of *Bolton Abbey* and *Cherry Ripe* would alone, apart from his portrait work, have rendered his name immortal. A donation of £15,000 was given by him in trust to the Royal Academy for the benefit of poor artists.

Couthon, GEORGE, French revolutionist, was born at Orcet, in Auvergne, in 1756. Brought up to the law, he became a member of the National Assembly and Convention, where he displayed a most vindictive spirit, urging, as a friend of Robespierre, both the death of the king and measures of atrocious cruelty, especially at Lyons, where, as a member of the Committee of Public Safety, he crushed an insurrection with an iron hand. He was guillotined in 1794, along with Robespierre and other incendiary leaders.

Coutts, THOMAS, banker, was born in 1735, and, with his brother James, founded the banking house of Coutts and Co. in the Strand, London, becoming sole manager in 1778. He married twice, and left the bulk of his property, some £900,000, to his second wife, formerly Harriet Mellon, an actress.

Couvade (French, from *couver*, to incubate), the name given by anthropologists to a group of customs prevalent among some races of low culture, in which the father acts—sometimes before and sometimes immediately after the birth of a child—as if the duties and cares of maternity devolved on him. In some cases the father is bound to abstain from certain foods, lest they should have a prejudicial effect on the unborn infant, as if there were some physical nexus between the two. In other cases, when the child is born, the father takes the infant and retires to bed, where he is treated as an invalid, and in due time receives the congratulations of his friends on the addition to his family, while the mother goes about her usual household work. Dr. Tylor is of opinion that the custom arose from the habit, common among savage races, of mistaking subjective for objective connection. Bachofen saw in the couvade the assertion of the paternal right to the child, and fixed its origin at the period when the matriarchal gave way to the patriarchal system. A more recent view, based on the existence of the usually imperfect but sometimes functional mammary organs in the male, is that the progenitors of the Mammalia were androgynous, and that the custom is a survival from the period when both sexes yielded milk, and thus nourished their young. (*See* Darwin: *Descent of Man*, ch. vi.; Geddes and Thomson: *Evolution of Sex; Notes and Queries*, 7th ser., viii. 442, ix. 9, 54.)

Covenant, an agreement. In law, an agreement or promise under seal contained in a deed or instrument sealed and delivered by the promisor, who is termed the covenanter, the promisee being the covenantee. A covenant being a contract, is largely subject to the same rules as other contracts. [CONTRACT, CONDITION, PROMISE.] A legal covenant may be personal, or it may affect a person only in a certain capacity, as, for instance, as the holder of certain land, in which case the covenant is said to run with the land. In theology the Old Testament is called a covenant, *i.e.* the covenant of God with His chosen people, and the Greek title of the New Testament is the New Covenant. In Scotland the word is used to denote the National Covenant of 1580, and also the Solemn League and Covenant of 1643, which was annulled in 1663, and the adherence to which was made treason in 1685.

Covent Garden, the well-known fruit, flower, and vegetable market lying to the north of the Strand, takes its name from the fact of its once having been a convent garden belonging to the Abbot of Westminster. The piazza was built by Inigo Jones in 1631, and in the seventeenth century was a place of fashionable resort often mentioned in the writings of the time. It was not till 1656 that the practice of holding a market there began to grow up. The market and the streets leading to it are a sight worth seeing early on a summer morning. St. Paul's church, which lies to the W., was burnt down in 1795. [For Covent Garden theatre *see* THEATRE.]

Coventry, a midland city and county, parliamentary and municipal borough, and market town of Warwickshire, on the Sherbourne, a tributary of

the Avon, 18 miles S.E. Birmingham, and 94 N.W. London. The town is in part ancient, and has some good old timber-fronted houses. There are some fine public buildings, among them St. Michael's church—said to be the largest parish church in England—with a spire 300 feet high, Trinity church with a spire of 237 feet, and St. Mary's fourteenth-century hall, notable for its ornamental work, its carved oak roof, its tapestry, and fine painted window. There is a free public library, and the cemetery is one of the most beautiful in England. Owing to its central position Coventry is well placed for commerce, and besides its railway communication it is well served by canals, the Coventry canal joining the Oxford canal. The principal industries are cotton, woollen, worsted, and art-metal work, with silk dyeing, while its ribbons and watches are widely renowned, and of late years it has become the chief seat for the manufacture of bicycles and tricycles. Till the Restoration the city had walls, but these were destroyed in Charles II.'s time as a punishment to Coventry for having sided against the king in the Civil war. There are ruins of a Benedictine priory founded (1043) by Earl Leofric and the Lady Godiva, the name of the latter being also kept alive by the procession which perpetuates the memory of her gaining freedom from taxation for the townfolk by riding naked through the streets in the manner and under the conditions described by Tennyson in a well-known poem. Here, too, took place the trial by wager of battle between the Dukes of Hereford and Norfolk in the reign of Richard II. Mary Stuart was for a time imprisoned here. There is a statue of Stanley, the introducer of the modern tricycle. The parliamentary borough returns one member.

Coventry, Sir John (1640–1682), was a member of the Long Parliament. Taking part with the Royalists, and sharing in their vicissitudes, he was made a Knight of the Bath in 1660. In 1667 he was returned to Parliament by the borough of Weymouth, and managed to offend the Court party by his proceedings in Parliament. Some ruffians of this party waylaid him and slit his nose, and in consequence Parliament passed in 1670 an Act directed against the offence of cutting and maiming, generally known as the Coventry Act.

Coverdale, Miles (1488–1568), an English bishop, widely known as a translator of the Bible into English. Born in Yorkshire, he was educated at Norwich and at Cambridge, and joined the Augustinian Order of Friars, being ordained priest. He was one of the first to become a Protestant, and, possibly owing to the danger he was consequently exposed to, he went abroad. In 1535 he made a translation of the Bible, his version of the Psalms, which is of far greater beauty as English than that of the Authorised Version, being still used in the Book of Common Prayer. In 1538 he went to Paris, apparently with the view of publishing his translation, but the Inquisition seized and destroyed the work. But he had a share in the "Great Bible," which was published in England in 1539. In 1540 he again went abroad, but in 1547 he was in England, and in 1551 was appointed to the see of Exeter. In Mary's reign he was imprisoned, but escaped with his life, and went into exile first to Denmark, and then to Geneva, where he took part in the Geneva translation. He came back to England, but was not reappointed to his bishopric. He, however, became the rector of St. Magnus's church in London, which living he resigned in 1566, and spent the remaining years of his life in retirement, giving up his time to literary pursuits and the study of botany. He was buried in 1569 in the church of St. Bartholomew, whence, upon the destruction of the church in 1840, his bones were removed to St. Magnus's church.

Covilhão, a Portuguese town in the province of Lower Beira, on a small tributary of the Tagus, near the Sierra da Estrella, 30 miles N. of Castello Branco, and 15 miles S.W. of Guarda. A brown linen is manufactured in the town, as well as woollen goods and hats. In the neighbourhood are hot sulphurous springs. Pedro de Covilhão, who travelled in 1490 to India and Abyssinia, was born here.

Covington, a town of the United States of America, in Kentucky, at the junction of the Ohio and the Licking, opposite Cincinnati, of which it is almost a suburb, being joined to it by a fine bridge. The manufactures are cotton, iron, distillery, glass, nails, and tobacco.

Cow. [Cattle.]

Cow Bird, Cow Blackbird (*Molothrus pecoris*), the best known species of Molothrus, a parasitic genus of Hang-nests, ranging from La Plata to the North of the United States. Length about seven inches, plumage mostly black, with metallic lustre in the male, olive-brown in the female. The name refers to their habit of keeping near cows, and "finding from their parasitic insects or their droppings opportunities for food." [Cuckoo.]

Cowcatcher, a wedge-shaped projection fastened in front of a railway locomotive in order to thrust aside any impediment which may obstruct the line. It is used chiefly in unenclosed country where cattle and other animals are likely to stray upon the line. It is largely if not universally used in America, where it does duty also at times as a snow plough.

Cowell, Edward Byles, an English Sanscrit scholar, born in 1826 at Ipswich, and educated at the grammar school there. He went to Magdalen Hall, Oxford, and was appointed Professor at Calcutta. In 1867 he was appointed Professor of Sanscrit at Cambridge, and in 1874 became Fellow of Corpus Christi College.

Cowen, Frederick Hymen, a musical composer, born in 1852 in Jamaica. He has composed the operas *Pauline* and *Thorgrim*, cantatas, symphonies, overtures, piano-pieces and numerous songs.

Cowes, East and West, two towns, one on each side of the river Medina, in the Isle of Wight, co. Hants, almost opposite Southampton Water, and about equidistant from Portsmouth,

Southampton, and Ryde, between each of which places and Cowes there is regular communication by steamer, while a steam ferry over the Medina estuary—here 600 yards wide—unites the east and west towns. The towns seem to have had their origin in two forts erected here by Henry VIII. in 1640 for the defence of the Medina. Of these the West Castle is now the Club-house of the Royal Yacht Squadron, which has its headquarters here. Besides the yachting which enlivens Cowes in the summer and employs many of the population, there is some ship building. Osborne House, the Queen's residence, East Castle and Norris Castle are in the neighbourhood.

Cowley, ABRAHAM, an English poet (1618–1667), contemporary of Milton, whose fame he eclipsed in his own day, though now he is almost neglected. He was born in the City of London, and first had his poetic instincts roused by finding among his mother's books and reading Spenser's *Faery Queen*. At 10 years old he wrote a poem, *Pyramus and Thisbe*, and in 1630 *Constantia and Philetus*. He then went to Westminster school, and wrote an elegy on the death of Dudley, Lord Carlton. At 16 he produced *Love's Riddle;* and in 1636 he proceeded to Trinity College, Cambridge, where he wrote the *Epic of King David*, a work to which Milton is said to have been under obligation. He took the Royalist side in the Civil war, and went to Oxford, where he enjoyed the friendship of Falkland. After the battle of Marston Moor he went into exile, and did the royal family much service by conducting a cipher correspondence between Charles I. and the Queen Henrietta Maria. He travelled much and worked hard, but still devoted much attention to literature. In 1656 he was in England, and enjoyed great fame. He published a collection of his works, among them his *Pindaric Odes*, and some miscellanies. His *Cutter of Coleman Street* appeared in 1663. He spent the later years of his life in literary retirement at Chertsey. He was buried in Westminster Abbey.

Cowley, EARL, HENRY RICHARD CHARLES WELLESLEY (1804–1884), an English diplomatist, son of the first Baron Cowley, the younger brother of the first Duke of Wellington. After being educated at Eton he became attaché at Vienna, going afterwards on diplomatic service to Constantinople and Switzerland. He was ambassador to France (1852–1867), and took part in the Paris Congress of 1856, and in the conclusion of Cobden's treaty in 1860. He was created Earl Cowley in 1857, and was made a K.G. in 1866.

Cowper, WILLIAM (pronounced COOPER), was born at Berkhampstead on November 26, 1731. His father, the rector of that place, was the second son of Spencer Cowper, judge in the Court of Common Pleas, and nephew of William Cowper, who, after the Act of Union with Scotland in 1707, was made first Lord High Chancellor of Great Britain. His mother, Ann Donne, belonged to an old family settled in Norfolk. She died when he was six years old, leaving an impression upon his heart to which he gave utterance more than fifty years afterwards in the lines, *On the Receipt of my Mother's Picture*. After her death, he was sent to a school at Market Street, where he suffered much from the tyranny of the elder boys. His eyesight becoming endangered, he went to live with an oculist, whom he left at the age of ten, in order to enter Westminster school. Here he was happy and studious, gaining the classical knowledge which in later life enabled him to translate Homer. At eighteen he was articled to a solicitor, in whose house he lived for three years. At the end of this period he took chambers in the Temple, where he resided until he was thirty-three. He was called to the bar in 1754, but devoted himself to the study of literature. Always prone to sadness, and obliged, in the first part of his residence at the Temple, to seek a cure for depression in change of scene, he early experienced real sorrow in the death of his friend, Sir W. Russell, and in the separation from his cousin, Theodora Cowper, with whom he was in love. Loss deepened the sense under which he laboured all his life that he was "cast forth a wand'rer in a world unknown." In 1763 he was made Clerk of the Journals in the House of Lords, but was so filled with terror at the prospect of having to appear at the bar of the House, that his melancholy, already deep, increased into positive insanity.

He made three attempts to commit suicide, and was then placed at St. Albans, under Dr. Cotton, a physician who worked his cure, and substituted cheerful views of religion for the terrors from which he suffered. Upon his recovery he settled in Huntingdon in 1765, where he soon became an inmate of the house of Mr. Unwin, an elderly clergyman, who met with a fatal accident two years later. After this event, Cowper removed with Mrs. Unwin to Olney, attracted thither by Mr. John Newton, a man of much power, who was curate of that place. With this friend he wrote the *Olney Hymns*, which were published in 1779. Their composition had extended over several years, marked by an engagement to Mrs. Unwin, which was prevented from becoming a marriage by a long mental attack which prostrated Cowper in 1773. The plan of marriage was never renewed, but the poet and the widow continued to live together, and to her ministrations he owed many years of tranquil, though broken, happiness. He spent much of his time in his garden or his greenhouse, among his myrtles and his mignonette, amusing himself with his kittens, his hares, and his correspondence. The picture given in his letters is that of the life of a country gentleman of deep piety, with literary tastes, and much quiet humour and common sense. They are filled with genial gossip on local affairs or politics, or with remarks on literature, in which Cowper showed a love for simplicity, and an appreciation for Milton, that marked his originality in a generation whose taste was guided by Dr. Johnson. Much of his time and sympathy was given to the lace-makers of Olney, who knew him as "the Squire," or "Sir Cowper."

In 1781 Cowper anonymously published a poem, *Antithelyphthora*, in answer to *Thelyphthora*, a work by his cousin Madan, chaplain of the Lock

Hospital, designed to prove that polygamy as permitted in the Old Testament was intended to be a permanent institution. In the following year he brought out a volume containing *Table Talk*, *The Progress of Error*, *Truth*, *Expostulation*, *Hope*, *Charity*, *Conversation*, *Retirement*, and some shorter poems. In the same year he wrote *John Gilpin* in consequence of a story told him by Lady Austen. It was published anonymously and had a great success. At the suggestion of the same lady he wrote *The Task*, which with *An Epistle to John Hill*, *Tirocinium*, and the now acknowledged *John Gilpin*, was brought out in 1785.

No sooner was *Tirocinium* finished than Cowper set himself to the most laborious task of his life, the translation of Homer. At that time Pope's translation was generally thought to be unsurpassable, but Cowper's critical taste led him to agree with "the *literati*," who, he said, had settled that, "although Pope has given us two pretty poems under Homer's titles, there is not to be found in them the least portion of Homer's spirit, nor the least resemblance of his manner." In particular he found fault with the vehicle of rhyme, and adopted blank verse as his own medium of translation. Owing to fresh mental trouble the book was not ready for publication until 1791.

In the same year Mrs. Unwin had an attack of paralysis, and gradually from that time gloom deepened round Cowper, broken only by a visit to the poet Hayley in Sussex in 1792, when Romney painted his portrait. He had by this time already fallen under the influence of a schoolmaster at Olney named Teedon, who undertook to interpret spiritual voices which spoke to the disordered poet. Material prosperity came towards the close of his life. He had hitherto lived on the charity of his relations, but his Homer brought him £1,000, and in 1794 he received a pension of £300 from the king. He was, however, already incapable of managing his own affairs. In the following year his cousin Johnson removed him and Mrs. Unwin from Weston Underwood, a village near Olney in which they had been living for the last nine years, to his home at East Dereham, where Mrs. Unwin died in 1796. Cowper lingered miserably until the 25th of April, 1800, when he passed away. His last original work was *The Castaway*. After his death were published *Translations from the French of Madame de la Motte Guyon*, and some translations of the Latin and Italian poems of Milton.

As a writer, Cowper may claim to have taken a permanent place. His deep religious feeling, his veins of irony and humour, his mastery of a style, clear and simple, and flexible enough to pass at will from light badinage to real solemnity, rank him high among the poets of the eighteenth century, and in many respects apart from them. In his love for nature, and his interpretation of its teaching in the light of faith, he has frequently been considered the forerunner of Wordsworth. The real charm of the man, perhaps, is most felt in his letters, which unfold in the most winning way the whole drama of his chequered life. No English man of letters has left, in matter or in style, a more beautiful or more touching autobiography.

Cowpox. [VACCINATION.]

Cowries, a group of Gastropoda (q.v.) belonging to the family Cypræidæ, and the genus Cypræa. They are carnivorous in habit, and have an oval shell ; the mantle extends back as two lobes, and as these deposit shell, the spire is concealed in the adult by a covering of smooth, polished, porcellanous material. The lip becomes much thickened and the mouth contracted when the animal becomes adult ; this gave rise to the old idea that the animal abandoned its shell and formed a new one at successive periods. There are about 150 species known, most of which come from tropical seas ; only the small *Trivia europæa* occurs on the English coasts ; this species ranges from Norway to the Mediterranean, and is found fossil in the Crags. Many of the tropical species are larger, and others are well-known owing to their use as currency. *Cypræa tigris* is one of the largest and most handsome, and is frequently used for cameo cuttings. *Cypræa princeps* is one of the most valuable owing to its excessive rareness, as much as £40 having been paid for a single specimen. The species used for currency are smaller and very abundant. The one most frequently employed is the Indian *Aricia moneta ;* in India between 3,000 and 4,000 go to a rupee, while in Siam over 6,000 are worth a tical (1s. 6d.). In Africa their value is higher, and they are used in strings of 100 in each ; a string is worth about 2½d. The earliest Cowries occur in the Cretaceous rocks of India.

Cowslip, the popular name of *Primula veris*, also in some districts known as *paigle*, one of our favourite spring flowers. It grows throughout Europe and Western Asia, occurring at an elevation of 1,600 feet in Northumberland, often stunted on poor limestone uplands and flourishing on chalk or in stiff clay pastures. It has radical rosettes of obovate leaves with winged petioles, and erect peduncles surmounted by an umbel of short-stalked pendulous flowers. The limb of the yellow corolla is cup-shaped, and bears five orange spots at the throat, as alluded to by Shakespeare in *Cymbeline*. From the fragrant flowers a wine is prepared.

Cox, DAVID (1783–1859), an English landscape painter, at first in water colours and later in oils. He was born at Birmingham, and was in early life employed in his father's forge. Leaving this work, he became a theatrical scene-painter, finding in that calling valuable experience and practice. As a water-colour painter he almost marks an epoch, being specially English in his subjects and treatment. Almost his farthest visit afield for subjects was Bettws-y-Coed, a place he was very fond of and constantly visited. After his marriage he went to Dulwich, where he gave lessons in drawing and painting. He considered himself lucky to get an appointment of £100 a year in a ladies' school at Hereford, where he supplemented his income by lessons at the grammar school. Latterly he retired to Birmingham, where he lived in a suburb. His works are very numerous, though he destroyed many of them, and though they did not fetch a great price in his lifetime, their value

is going up. His ambition was to sell a picture for £100; now some have fetched upwards of £3,000.

Cox, Sir George, an English writer, born 1827. He was educated at Rugby and Trinity College, Oxford, and took orders in 1850. He succeeded to the baronetcy in 1877. He is best known as an advocate of the "solar theory" of the interpretation of mythology, on which he has written numerous works, as also a History of Greece and a *Life of Bishop Colenso*. On the death of that prelate he was elected his successor by the Synod of Natal; but, there being a rival Anglican bishop in the colony, the Crown refused to confirm the appointment.

Coxe, Henry Octavius (1811–1881), an English man of letters, to whom Dean Burgon has given a place in his *Lives of Twelve Good Men*. Born at Bucklebury, Berkshire, he was educated at Westminster, and at Worcester College, Oxford. In 1833 he received an appointment at the British Museum, and at the Bodleian Library, Oxford, in 1838, becoming head librarian in 1860. He did not publish much original matter, though he did good service to literature by editing catalogues of MSS. in the colleges and halls of Oxford and the Bodleian Library. He also travelled in the East, and discovered valuable Codices.

Coyapos, a large Brazilian nation, formerly widespread throughout Goyas and the conterminous provinces of São Paulo and Matto Grosso. They belong to the Tupi family, of which they are one of the chief branches. The Coyapos, now mostly civilised, are described by Dr. Kupfer in *Zeitschrift für Erdkunde*, p. 244; Berlin, 1870.

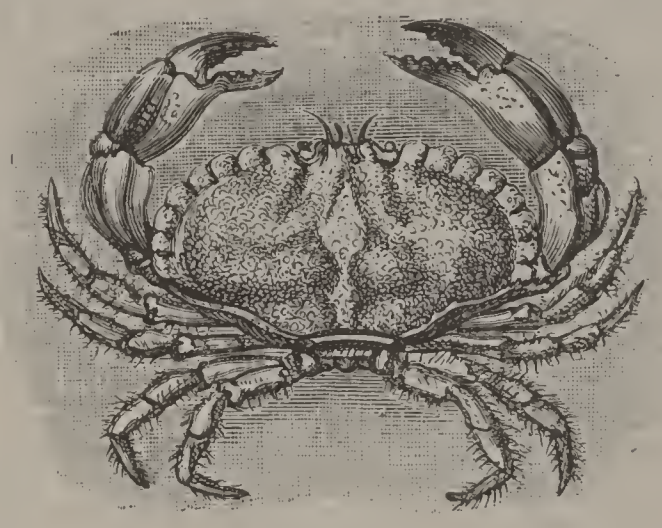
Coyote (*Canis latrans*), the Prairie Wolf, ranging from Mexico to lat. 55° N. It is about the size of a pointer dog, with greyish fur, darker on the back, and bushy tail. These animals hunt in packs, and are much fleeter than the common wolf (q.v.).

Coypu (*Myopotamus coypus*), a large South American rodent, the sole species of the genus. These animals live in burrows near lakes and rivers, and, it is said, sometimes on the seashore. They are good swimmers, and feed on aquatic plants and occasionally on molluscs. The length, including the tail which is scaly, is about 30 inches. The flesh is excellent eating, and the brownish-yellow fur is sold under the Spanish name of Nutria (otter).

Cozens, John Robert, a water-colour painter (1752–1800). He was a grandson of Peter the Great of Russia. He painted, among other things, the trees in Windsor Forest. He lost his reason in his later years. His drawings are much appreciated, and there is a good collection of them in the British Museum print room.

Crab, in mechanical engineering, is a small portable crane used in lifting various materials. [Crane.]

Crab. The Crab is the best known member of the short-tailed ten-footed Crustacea, *i.e.* the group Brachyura of the order Decapoda. In the main points of its anatomy it agrees with the Crayfish, and as this latter is simpler and more convenient for dissection, it is taken as the type of the order. The crab that is mostly used as food in England is known as *Cancer pagurus;* the commoner Shore Crab (*Carcinus mœnas*) is also largely used. If a specimen of either be compared with a Crayfish, it will be seen that the larger anterior plate (cephalothorax) covers the whole of the upper or dorsal surface of the body, whereas in the Crayfish it occupies only the front half, while behind it occurs a long jointed abdomen or "tail." The plate, moreover, is broad in the Crab, and narrow and long



CRAB.

in the Crayfish. The eyes are placed on stalks (peduncles) on the anterior margin, and look upward and forward instead of sideways. The abdomen in the Crab is much reduced in size, and is bent up under the main mass of the body (or thorax). The appendages are constructed on much the same plan as in the Crayfish, but those on the abdomen are rudimentary. The general anatomy of the soft parts agrees with that of the Crayfish, though in the Crab they are more closely packed together owing to its broader and shorter shape. This is notably the case with the nervous system in which the ganglia, except the first two pairs, are closely collected together into one group, instead of extending as a long chain of ganglia as in the Crayfish. The hard outer skin or shell of the crabs is not capable of growth, and is therefore periodically thrown off to allow of the expansion of the animal; this is known as "ecdysis," and before the new coat has again become hard the crabs are known as "soft crabs." The crabs are mainly inhabitants of the sea, and breathe by branchiæ or gills; but there are several genera of Land Crabs, such as *Gecarcinus* or the Calling Crabs (*Gelasimus*), in which air is admitted directly into the branchial chamber where it aërates the branchiæ. The development of the crabs shows that they are a more specialised group than the Long-tailed Decapoda (Inacrura), such as the Lobster; for in most cases the young pass through a "Zoœa" stage in which they have a long, narrow six-jointed abdomen resembling that of the Lobsters, etc. In some of the Land Crabs, such as Gecarcinus, the development is direct, *i.e.* there is no metamorphosis. As regards geological distribution, the crabs make their first appearance in England in the Oolite rocks with the *Palæinachus longipes* (H. Woodw.) of the Forest

Marble. They are fairly abundant in the Tertiary rocks, and considerable numbers may be found in the London Clay of Sheppey; these belong especially to the genera *Xanthopsis*, *Plagionotus*, etc. Of recent crabs the small Pea Crabs (*Pinotheres*), the large *Inachus* of Japan which measures ten feet between the tips of the great claws, and the burrowing Racer Crab of Ceylon (*Ocypoda*) are among the more interesting forms. The "Hermit Crabs" belong to the Inacrura (sub-order Anomura), and are not, therefore, included here.

Crab, ROGER (1621 – 1680), an eccentric Englishman who became a hermit and tried to carry out literally some of the precepts of the Gospel. For instance, after seven years' service in the Parliamentarian army, he set up in business, but in a year or two sold all he had and gave the price realised to the poor. He retired to a solitary hut, and led a strictly vegetarian life, his only drink being water. He was persecuted by his neighbours for his eccentricities, and by the authorities for breaking the laws. He wrote *The English Hermit*, *Dagon's Downfall*, and a tract against the Quakers.

Crabbe, GEORGE (1754–1832), an English poet who has been described as the poet of East Anglia, since his poems are vivid exponents of East Anglian life and manners. Born at Aldborough in Suffolk, he was apprenticed to an apothecary with a view to becoming a doctor. He soon showed poetical tastes, and, having gained a prize for a poem on Hope, he gave up the idea of medicine, and came to London to starve upon literature. At the moment when he was in the greatest straits he applied to Burke, who took him in hand, and introduced him to Reynolds, Johnson, and Fox, and to the publisher Dodsley. He visited Burke at Beaconsfield, and it was there that he composed *The Village*, which with *The Library* he published after making the acquaintance of Burke. In 1781 he was ordained, and after being for a short time curate of Aldborough, he was appointed, through Burke's influence, domestic chaplain to the Duke of Rutland, and rector of Frome St. Quintin, Dorset, and soon after obtained such preferment as made him a considerable pluralist. He married the love of his youth, and in 1813 he was presented to the rectory of Trowbridge, Wilts, where he spent the remaining years of his life. *The Newspaper* (1785) was followed by a long cessation from publication, but in 1809 he published *The Parish Register*, in 1810 *The Borough*, and in 1812 *Tales in Verse*, his last work appearing in 1819, *Tales of the Hall*. He produced very little prose, a natural history of the Vale of Belvoir, written for *Nicholl's History of Leicestershire*, being, perhaps, the best known of his prose writings. As a poet he is distinguished by originality, and a stern realism which presents the naked truth not always in the most pleasing form. He is a morbid anatomist of nature, and is oftentimes tediously minute, while his style is sometimes harsh, and his taste frequently defective.

Cracow, a town of Austria, situated at the junction of the Rudawa and the Vistula, on a plain in an amphitheatre of hills. The town is the seat of a Catholic bishopric and of a university. Among the industries are the manufacture of paper, pottery, tobacco, wool, leather, spirits, and beer. Cracow presents a fine view from the outside, but the streets are narrow and dirty. Of the forty churches, the most notable are St. Michael's (890), and St. Wenceslas's cathedral, begun in 1000 A.D. The gate of St. Florian (1498) is a good specimen of Gothic architecture. The Royal Castle (700) is now a barracks and hospital. The bishop's palace (992), which was damaged by fire in 1850, contains paintings by Michael Stachovitz, the subjects being drawn from Polish history. There is a linen hall which will hold 6,000 people. A large square occupies the centre of the town, and outside are fine limes, chestnuts, and poplars. Before the Christian era there was a Slavonic city called Waweb, whose name is given to one of the hills in the neighbourhood. In 700, Krakus and his daughter Wanda did much for the city, which, by reason of its central position, became the second capital of Poland. After a Tartar attack in 1241, it attained, under Sigismond II. (1506–1548), a position of splendour and importance. In 1544 Protestant doctrines made their appearance, and an impetus was given to them by the dispersion of the students in 1549, as they brought back the new doctrines from Germany. The last king of Poland crowned at Cracow was Frederick Augustus III. (1734). From 1815–1846 a protected republic was established, but at the latter date Cracow became an Austrian grand duchy.

Crag, the East Anglian term for a shelly gravel or sand, now generally transferred by English geologists to the whole of the Pliocene system, which in the eastern counties is mainly represented by such rocks. This system represents the epoch when the continents were taking their present form and the climate of Northern Europe was gradually refrigerating to the cold of the Glacial Period (q.v.). It is only well represented in Europe in the basin of the Mediterranean, where several thousand feet of marine beds had accumulated before the first outbursts of Etna and Vesuvius. In England it is represented by some 100 to 150 feet of sandbanks deposited during a subsidence of the east coast, with patches at St. Erth in Cornwall, Lenham in Kent, and elsewhere. Of the numerous mollusks they contain at least 84 per cent. belong to living species. These beds may be subdivided as follows :—

7. Westleton and Mundesley Crag and Cromer Forest-Bed Group, 10–70 feet.
6. Chillesford Clay and Sand, each 8 feet thick.
5. Norwich, or Fluvio-marine, Crag, 5–10 feet.
4. Red Crag, 25 feet.
3. Lenham Beds.
2. St. Erth Beds.
1. White, Suffolk or "Coralline" Crag, 40–60 feet.

At the base of the series are beds of phosphatic nodules (q.v.) and fossils of cetaceans, sharks, mastodon, elephant, rhinoceros, etc., probably derived from the denudation of an earlier bed, possibly the "Black Crag" or glauconitic sands of

Antwerp, which has Miocene affinities. The Coralline Crag (q.v.) contains 5 per cent. of northern forms of Mollusca, the Red Crag 10 per cent., and the Norwich Crag 14 per cent. The numerous Polyzoa, *Terebratula grandis* and *Astarte Omalii* are specially characteristic of the Coralline Crag; *Trophon antiquum* var. *contraria*, the left-handed dog-whelk, of the ferruginous Red Crag; land and fresh-water shells with northern marine forms, *Elephas meridionalis*, *E. antiquus* and the giant beaver *Trogontherium*, of the Norwich Crag; *Mya truncata* and other northern marine shells, of the Chillesford Beds; and the Irish deer, *Cervus megaceros*, the Mammoth *Elephas primigenius*, with the species just named, and *Machairodus*, the sabre-toothed tiger, of the Forest-bed. This last series is estuarine and marine with peat and drifted fir-stumps and many plant-remains. It is only exposed under the Boulder Clay cliffs at low tide. The pre-glacial gravels at Westleton and Mundesley and elsewhere may be of the same age as the Forest-bed. The numerous mollusks of the St. Erth beds, about 60 per cent. being living species, indicate an age intermediate between the White and the Red Crags; whilst the Lenham sands filling pipes in the Chalk of the North Downs yield an assemblage perhaps even more closely related to the former, but still intermediate.

Craig, JOHN (1512–1600), a Scottish reformer, who, after an education at St. Andrews, became a Dominican, and was imprisoned on a charge of heresy. He went abroad, and for some time performed the ordinary duties of his order, but after a study of Calvin's Institutes he became a Protestant, and was condemned by the Inquisition. The death of the Pope saved his life, as the mob broke open his prison, and he fled to Vienna where Maximilian II. protected him. He returned to Edinburgh, and was associated with John Knox in his work, and succeeded him in 1852 as leader of the Scottish Church. Among his works were *The King's Confession* (1581), *Craig's Catechism* (1592), and he had a share in producing the *Second Book of Discipline*.

Craig, SIR THOMAS (1538–1608), a Scottish jurist and poet. He graduated at St. Andrews University in 1555, and then went to Paris to study the civil and canon laws. He returned to Scotland and was called to the bar in 1563. The next year he was appointed Justice-depute, and in 1574 he was Sheriff of Edinburgh. In 1606 he was procurator for the Church. James I. wished to knight him, and though he declined the honour he received the title. His chief work was *Jus Feudale*, a treatise on feudal law. He was much interested in furthering the union of England and Scotland, though strong in asserting the feudal independence of the latter country. His first poem (1565) was in honour of the marriage of Queen Mary to Darnley.

Craig Fluke (*Pleuronectes cynoglossus*), a sole-shaped flat fish, occasionally met with on the British coasts.

Craigleith, half-way between Edinburgh and its port Leith, has important quarries in the sandstones of the Lower Carboniferous (q.v.), which have yielded much of the stone used for building in Edinburgh.

Craik, GEORGE LILLIE (1799–1866), a man of letters of this century. Born in Fifeshire, he entered at St. Andrews, and at 25 years old came to London to enter on a literary life. His *Pursuit of Knowledge under Difficulties* was published in 1831, and from that time he was a diligent and voluminous writer. In 1849 he was appointed Professor of History and English Literature at Queen's College, Belfast, a post that he occupied till his death. Among his many works may be mentioned his *History of Literature and Learning in England*, *Spenser and his Poetry*; *Bacon: His Writings and his Philosophy*, and *The English of Shakspeare*.

Craik, MRS. (Miss Mulock) [1826–1887], an English novelist, best known as the author of *John Halifax, Gentleman*, a book whose charm has been universally appreciated, and has led to its being widely translated. Of her other novels the first (1849) was *The Ogilvies*, followed by *Olive*, *Head of the Family*, and *Agatha's Husband*. She has also written several other novels, articles in magazines, poems, and some volumes of essays, among them *A Woman's Thoughts About Women*. She married in 1865, and spent the rest of her life at Shortlands, in Kent.

Crake. [CORNCRAKE.]

Cramer, JOHANN BAPTIST (1771–1858), a pianist, born at Mannheim, in Germany, but brought up in England, where his father settled the year after his son's birth. He made a reputation in a series of Continental concert tours, and founded a musical publishing house in 1828. He lived for the latter part of his life, and died, in Paris.

Cramp, a term applied to involuntary contraction of muscle, accompanied by pain such as occurs in the calves of the legs after excessive exercise or during convalescence from acute disease. Cramp may involve the muscles of the trunk, it rarely invades those of the limbs, with the notable exception of the muscles of the calf of the leg. Varicose veins and gout seem to act as predisposing causes of cramp: again, muscular cramps are striking symptoms in the onset of certain acute diseases, notably cholera. In the treatment of cramp friction and forcible extension of the affected muscles opposing the spasm are the most effectual means of alleviating the distress occasioned by the seizure. The intractable forms of cramp met with in bedridden subjects are often alleviated by raising the head of the bed some six or eight inches. *Writers' cramp* or scriveners' palsy is a condition in which involuntary contraction of certain overworked muscles is associated with pain, and with more or less paralysis. It affects, as the names given imply, clerks and others who are engaged during the greater part of each day in writing. The history of the condition, unfortunately, is usually one of steady progress from bad to worse. The right hand is finally rendered useless for

writing purposes. In some instances where the left hand has been employed by sufferers. in order to continue to earn a livelihood, it, too, has been attacked. Rest of the affected muscles is practically the only satisfactory form of treatment. Electricity is of service in some cases.

Cramp Ring, a ring worn as a preservative against cramp. In England such rings were solemnly consecrated by the king on Good Friday.

Cranach, Lucus (1472–1553), a German painter, born at Kronach, in Franconia. Next to nothing is known of his birth and education, but he appears to have attracted attention before the end of the fifteenth century. In 1504 the Elector of Saxony gave him an appointment, and a picture of this date exists. For some years he practised many branches of his art, painting altar pieces, still life and game for house decoration, drawing on wood, engraving on copper plates, and designing dies for the mint. In 1500 he was appointed to make sketches of the Emperor Maximilian and the future Charles V. About this time the Duke gave him a printing monopoly, and also a monopoly of drugs in Wittenberg. Luther's Bibles were produced at his press. He was twice burgomaster of Wittenberg, but at a later period Wittenberg, with its prince and Cranach, fell upon evil times, the town being besieged and the prince captured, and Cranach accompanied him or joined him. He died at Weimar. His best painting is thought to be his *Rest of the Virgin* (1504), but his copperplates and woodcuts are his most representative productions. He painted many religious scenes and some mythological ones. But his chief work was portrait painting, and he painted most of the German reformers, notably Luther, and princes of the time. Portraits of Albert, Elector of Mainz, in the Berlin Museum, and of John, Elector of Saxony, in the Weimar Museum, are considered good specimens of his work.

Cranberry, the berry of the two species constituting the ericaceous genus *Oxycoccus*, probably so named from being eaten by cranes. They are slender creeping plants growing in bogs, with woody stems, small scattered evergreen leaves, drooping tetramerous flowers with rotate corollas, and crimson berries. The common cranberry, *O. palustris*. has ovate-oblong, cordate leaves, with revolute edges, and pear-shaped fruits. It is a native of Siberia, Northern Europe, and America, and is now imported from Russia, though formerly it was abundant in the fens of Lincoln and elsewhere. The large-fruited cranberry, *O. macrocarpus*, has flat, elliptic leaves and spherical berries, larger and brighter red than those of *O. palustris*. It occurs wild from Canada to Virginia, and is cultivated on poor land in New England, where an acre will yield from 80 to 100 bushels. Its fruit is largely imported into England for tarts. Cranberries are valuable antiscorbutics, and are used in Sweden to clean silver plate. The cranberry plant is the badge of the clan Grant.

Cranbrook, Gathorne-Hardy, Viscount, an English statesman, born 1814 at Bradford. He was educated at Shrewsbury and Oriel College, graduated in 1837. He was called to the bar 1840, and entered Parliament for Leominster in 1856. In 1865 he won the seat for Oxford University against Mr. Gladstone. He first became a member of the Ministry in 1858, and at various times filled several offices, the chief being Home Secretary (1867–8), Secretary for War (1874–8), Secretary for India (1878–80), and Lord President of the Council (from 1885, 1886). He was made a peer in 1878.

Crane, a book name for any of the Gruidæ, a family of wading birds allied to the Storks and Herons, but having the hind toe placed higher than those in front. *Grus*, with twelve species, absent only from the Neotropical region, is the type-genus. The straight, strong bill is longer than the head; nostrils longitudinal in a furrow; windpipe convoluted, except in the Asiatic Crane (*G. leucogeranus*). Many species are migratory; and this habit was

CRANE.

known to classic writers, and is noticed by Jeremiah (viii. 7). All are noted for their grotesque antics or "dances" when excited. The Common Crane (*G. cinerea*) breeds in the northern parts of the Eastern hemisphere, migrating southwards in close wedge-like bodies in winter. It was formerly a native of English fen-lands, but is now a rare visitor. Its height, when erect, is about four feet; forehead, top of head, and neck, dark slaty ash; a broad line of greyish white extends down each side of the neck; the general body plumage is soft ash-grey; the primaries black; tertiaries, which can be raised or depressed, tipped with bluish black. These plumes were formerly in much request for ladies' head-dresses. Cranes feed on worms, insects, small reptiles, seeds, roots, etc.; and their flesh is valued for the table. [Crowned Crane, Demoiselle.]

Crane, in *Engineering*, is a machine much employed at docks, wharves, warehouses, and elsewhere, for raising and lowering various materials. Cranes may be worked by hand, steam, high-pressure water, or. a plan which has recently been adopted, by electromotors. The simplest form

consists essentially of a vertical pillar, a long oblique arm or *jib* springing from the base of the pillar, its upper extremity reaching to the maximum height required; and a lifting-chain passing from a drum on the crane-post over a pulley at the top of the jib, and bearing at its other extremity the load to be lifted. Rotation of the drum produces upward or downward motion of the load, and is effected by hand or machine. The crane admits of rotation about the vertical post, this motion being produced by auxiliary apparatus. A direct-acting steam-engine, with small vertical boiler attached, is frequently mounted on the carriage that supports the crane, and is adjusted in position so as to balance the load lifted. The necessary force to lift the load might be too great to be applied directly at the drum; so a smaller force is made to effect this by a combination of spur-gearing. The crane being mounted upon a carriage possesses the advantage of being able to carry a load from place to place, and lines of rails are frequently laid down to facilitate this. The jib is to stand compression, and should therefore be designed so as to resist buckling. It is frequently hollow, or, in heavier types, of lattice-girder pattern. Armstrong's hydraulic cranes employ water at a pressure of 700 lbs. to the square inch, and the power is multiplied by a system of pulleys. The foundations supporting heavy machines must be carefully and substantially built, loads of fifty to a hundred tons, such as are lifted by the heavier cranes, being sufficient to crush weak foundations.

Crane, THOMAS FREDERICK, an American literary man, born at New York, 1844. He graduated at the New Jersey university, and has successively filled the posts of professor of modern languages of Spanish and Italian, and of the Romance languages, in Cornell university. He is chiefly known by his contributions to the study of folk-lore, and the history of the Romance languages, his best admired works, perhaps, being his *Italian Popular Tales*, *Romantisme Français*, and his edition of the thirteenth-century stories of Jacques de Vitré, Bishop of Acre.

Crane, WALTER, an English painter, born at Liverpool 1845, his father also being an artist. The son began his art training early, and much of his work has been book-illustrating. His *Lady of Shalott* was exhibited at the Royal Academy in 1862, and for some years he exhibited in the Grosvenor Gallery. He has produced good water-colour landscapes, and in 1888 became a member of the Royal Society of Water-Colour Painters.

Crane Flies, or "DADDY LONGLEGS," a family of flies (DIPTERA), known as the *Tipulidæ*. The main characters of this group are the long slender legs, long narrow wings, a cylindrical abdomen, and elongated antennæ. *Tipula oleracea* (Linn.) is probably the commonest English species, and its larvæ do serious damage to grass by feeding on the roots. They are especially well known, owing to their occurrence all through the year, as some of them, *e.g.* the "Winter Gnat" (*Trichocera hiemalis*, Incig.), attain maturity then; this species is a small one, being only about $\frac{1}{4}$ inch in length, but it lives in large swarms. The largest known Crane Fly is a species from North China, which measures $4\frac{1}{2}$ inches across the wings.

Cranesbill, the English name for the genus *Geranium*, so called from the long beak of the fruit formed by a central prolongation of the axis (carpophore) in grooves in which lie the styles of the five carpels. The genus comprises about 100 species, mostly herbs, natives of temperate regions, especially sea-shores and sandy regions, about a dozen species being British. Their stems are swollen at the nodes, their leaves palmate in venation or lobings, and their flowers polysymmetric and pentamerous, with imbricate sepals, and ten stamens united at the base of their filaments. When ripe, the five carpels separate as indehiscent cocci [REGMA], the styles coiling elastically from the carpophore. The genus gives its name to the order *Geraniaceæ*. [PELARGONIUM.]

Cranganore, a town on the Cochin river in the Cochin state, Southern India, eighteen miles N. of Cochin town. There was an early establishment of Christians here, and a Jewish settlement of early date, and St. Thomas the Apostle is said to have visited the town. It belonged for a time to the Portuguese, then to the Dutch, and then to Tippoo Sahib till 1789.

Craniata. [CHORDATA, VERTEBRATES.]

Craniidæ, a family of Brachiopoda, of which *Crania* is the type-genus. They are fixed by the flat ventral valve to rocks, echinoids, mollusca, etc. The upper or dorsal valve is limpet-shaped. The two valves are connected only by muscles. There is no hinge, so that the family belongs to the subclass Inarticulata. *Crania* was a common fossil in the Chalk. The family ranges from the Silurian upwards.

Cranium. [SKULL.]

Crank, in *Mechanics*, is a lever with one end grasping a rotating shaft, and the other end a connecting rod. Its usual purpose is to convert the alternating motion of the end of the connecting-rod into the rotating motion of the shaft. It is made generally of cast-iron, wrought iron, or of case-hardened steel. The connecting-rod grasps the crank by a cylindrical crank pin, which fits closely in a hollow cylindrical bearing or *bush* of softer metal, such as brass or gun metal. Such a lever is the single crank, which may be fitted on to the end of the shaft. If, however, the motion is to be given to a central portion of the shaft, a piece must be cut out of the latter, and a double crank fitted on, the general alternative being to fix on an eccentric (q.v.).

Cranmer, THOMAS (1489–1566), an English archbishop, born at Aslacton in Nottinghamshire, and educated at Jesus College, Cambridge, of which society he became fellow in 1510, vacating his fellowship soon after on account of marriage, but receiving it again upon the death of his wife before the expiry of the year of grace. In 1523 he

was ordained, and lectured in divinity in his college, and was examiner in divinity for the University. In 1528 an outbreak of the sweating sickness emptied Cambridge, and Cranmer with two pupils went to Waltham in Essex, where he met Gardiner and Fox who were in attendance upon Henry VIII., and pleased them and, through them, the king by his view that Henry could obtain a divorce from the ordinary ecclesiastical courts without the necessity of an appeal to Rome. The king employed him about the divorce question, made him archdeacon of Taunton, engaged him to write a treatise and to argue the question before the authorities of Oxford and Cambridge, and further sent him as a member of an embassy to Rome upon the subject. In 1531 the king appointed him ambassador to the German emperor, and in Germany Cranmer married again, and was still in that country when Henry in 1532 summoned him to the vacant see of Canterbury, an honour which Cranmer tried to avoid. The archbishop carried out the king's wishes and tried the question in his archiepiscopal court, giving judgment against Queen Catherine, and a week later he crowned the new Queen Anne Boleyn. The next three years he spent chiefly in the affairs of his diocese, and in advancing the doctrine of the king's supremacy in matters ecclesiastical as against that of the Pope. He was subservient to the king in the matter of annulling Anne Boleyn's marriage, as later he was in that of Anne of Cleves. His great work, however, was the advancement of the Reformation, though he had not the courage to oppose the "Six Articles." The *Homilies*, which appeared in 1547, are considered to be some of them his own handiwork. His *Defence of the True and Catholic Doctrine of the Sacrament* is considered to set forth the tenets of the old-fashioned English High Church. At Henry VIII.'s death Cranmer became under the king's will head of the Council of Regency. During the reign of Edward VI. the archbishop was diligent in producing the First and the Second Prayer-book. His siding with Lady Jane Grey's party, in spite of his promise to Henry VIII., brought upon him, quite apart from other causes, the enmity of the new court party. His committal to the Tower in 1553 was followed by his death by burning in 1566, his besetting sin of weakness causing him to make recantations and reassertion of his opinions up to the last. On the whole, he seems to have been a man of good intentions and kindly amiable disposition, but his weakness and vacillation made him a time-server and a coward.

Crannog, Crannoge, a kind of lake-dwelling (q.v.), formerly used in Scotland, but principally in Ireland. It was an artificial island, formed of a framework of piles and staves, filled up with brushwood and kept down by stones and gravel, on the top of which was a thick layer of earth. On this huts were erected, and, when surrounded by palisades, the structure served as a stronghold. Some existed in county Monaghan in the 16th century.

Crashaw, RICHARD (1613–1650), English poet, born in London and educated at Charterhouse and Pembroke College, Cambridge, where he graduated in 1634. The year 1633 saw the publication of Herbert's *Temple*, and the next year Crashaw published his first work *Epigrammatum Sacrorum Liber*. In 1634 he became fellow of Peterhouse, and was ejected from his fellowship in 1644. Going to France, he became a Catholic and stayed in exile, his friend Cowley obtaining the influence of Queen Henrietta on his behalf. He went to Rome, and became secretary to Cardinal Palotta, in whose service he remained till 1649. While he was in exile, a collection of his secular and religious poems was published with the titles *The Delights of the Muses* and *Steps to the Temple*. In 1648 at Paris two Latin hymns were published. In 1652, after his death at Loretto, a collection called *Carmen Deo Nostro*, dedicated to the Countess of Denbigh, was brought out. Crashaw's poetry is not of a kind to commend itself to modern taste on account of its extravagant and fantastic images and expressions, but it contains fragments of great beauty. His mystic views and delicacy of character are visible in his works. Cowley's opinion of him is set forth in one of the prettiest elegies in our language.

Craspedota, a sub-class of the Hydrozoa (q.v.) including all those in which the medusa (or jelly-fish, q.v.) has the mouth constricted by a flat broad ring known as the velum. It includes three orders, the Hydroidea, Trachymedusæ, and Siphonophora. The first is the most important. Hydra (q.v.), the common fresh water polype, is its most typical member, but it also includes Cordylophora (q.v.), the Corynida (q.v.), the Hydrocorallina (q.v.), Campanularia, and the "Sea Firs." The Trachymedusæ develop directly by metamorphosis from a free Hydroid larva. The Siphonophora includes the Portuguese Man of War (*Physalia*). *Vellella*, and other less known types. All the Craspedota are marine except *Limnocodium* (q.v.), a small form found in the *Victoria regia* tank at Kew, and one recently found in Tanganyika; this latter is an additional argument for the originally marine origin of those lakes.

Craspedote Medusæ. [CRASPEDOTA.]

Crassulaceæ, an order of Calycifloræ (q.v.) allied to the Saxifragaceæ (q.v.) and comprising some 400 to 500 species in 24 genera They are characterised by their thick succulent leaves, being adapted to dry climates and situations, such as rocks, walls, and sandy plains, and are especially abundant in South Africa. Their flowers are in complex cymes, often dorsiventral, and are remarkably polysymmetric and pentamerous, having often five carpels as well as five sepals, five petals, and ten stamens. The fruit is a ring of follicles. Astringent roots, acrid foliage and emetic and purgative properties occur in the order. Though the genus *Crassula* is mainly African, some ten species of *Sedum*, the stonecrops, and single species of *Tillæa*, *Cotyledon* and *Sempervivum* are natives of Britain.

Crassus, MARCUS LICINIUS, a member of the famous first triumvirate with Cæsar and Pompey.

His wealth was great, and he increased it by judicious methods. In exile, on account of Cinna's proscription, he passed to Spain, and from there, at Cinna's death, he went to Africa and to Italy, and was received into favour by Sulla. He gained a decisive victory over Spartacus in 71, and was the next year made consul with Pompey, and made an ostentatious display of his wealth at his installation. As a triumvir he chose Syria as his province, and, having attacked Parthia, the Parthian general captured him and poured molten lead down his throat by way of indulging his love of riches, B.C. 53.

Crater, from the Greek *kratēr*, a bowl, the hollow formed by the explosive action, in the summit of a volcanic cone. Volcanic craters vary in size from the tiny orifices of small parasitic cones to huge circular chasms. That of Kilauea in the Sandwich Isles, the largest on the earth in an active state, is seven miles in circuit; but it is exceeded by others now extinct. These again are far exceeded by those on the surface of the moon, the action of its internal heat upon its surface having been far more violent in our comparatively small satellite than on our earth. The lunar crater Tycho is fifty miles in diameter and that of Copernicus not much smaller; whilst, if the "walled plains," such as Schickard and Clavius, are volcanoes, we must admit craters 133, and even 142 miles in diameter.

Cratinus, a Greek comic poet (519–422 B.C.), contemporary of Aristophanes. He wrote some twenty-one comedies, some of which took prizes in competition; his *Bottle* (Putiné), produced 433, in the poet's ninety-sixth year, taking the first prize, while the *Clouds* of Aristophanes took the third.

Craufurd, ROBERT, English general, was born 1764. He entered the army as ensign in 1779. In 1790–2 he served under Lord Cornwallis against Tippoo, and in 1797, being then colonel, was employed in the operations in Ireland. For a short time before 1805 he sat as M.P. for East Retford. In 1807 he was on General Whitelocke's staff during the ill-fated expedition to South America, and led the attack on Buenos Ayres. In the following year he commanded the light brigade of Sir David Baird's division in the Peninsula, and took part in Sir J. Moore's retreat on Corunna until December 31, when his brigade was ordered to embark at Vigo. In 1809 he was in command of the light brigade under Sir Arthur Wellesley [WELLINGTON], and took part in the campaign against Masséna, doing good service in all the battles of that period. Offering battle contrary to orders on the Coa, July, 1810, he gave Masséna an excuse for claiming a victory. In 1811 he became major-general, and in January, 1812, was mortally wounded at the assault of Ciudad Rodrigo, dying a few days later. His reputation is that of the most brilliant light infantry commander of his time.

Crawford, THOMAS (1814–1857), an American sculptor, born at New York. Having learnt to draw and execute wood carving, he practised monumental sculpture, and at the age of 20 he went to Rome, where he studied under Thorwaldsen. His *Orpheus in Search of Eurydice* (1839) brought him into notice, and he from that time was a great producer, ranking in Rome next after Gibson. In 1856 a tumour on the brain destroyed his sight, and he died in London, where he had come for advice. His son, F. MARION, born in 1854, is a successful novelist.

Crayfish. The Crayfish is the most frequently quoted type of the Decapod Crustacea, as it is abundant in English streams, and its size is convenient for dissection. The name is a corruption of the French *écrevisse*, and is not in any way connected with "fish." The Crayfish consists of three regions—head, thorax, and abdomen; each of these is composed of a series of segments, more or less united together, and each bearing a pair of jointed appendages. There are twenty segments in all—five in the head, eight in the thorax, and seven in the abdomen. The head and thorax are closely united, and the hard shell which protects the animal is there formed into a large plate, the cephalothorax; the division into head and thorax is, however, marked by a furrow. The head bears in front a sharp projecting point (the rostrum), on each side of which is a large compound eye borne on a short movable stalk; on the under surface the head bears five pairs of appendages, viz. the antennules, antennæ, mandibles, and two maxillæ; the two first are the feeling organs, while the three last surround the mouth and are concerned in the crushing of the food. The thorax bears three pairs of jaw feet or maxillipedes, the chelæ or great claws, and four pairs of walking limbs. The abdomen is provided with six pairs of "swimmerets"; the last joint or telson has no appendages, but is flattened out with those of the preceding pair, and form the powerful swimming tail. The appendages, thus, have very varied functions, and their shape is consequently very different. Nevertheless, they are all constructed on one fundamental type. The simplest form is that of the swimmerets, which consists of a simple or two-jointed basal plate (the protopodite) bearing two filaments, of which the outer one is known as the exopodite, and the inner as the endopodite. The antennæ and antennules consist of the same three parts: the other appendages are more complex; thus, in the third jaw foot or maxillipede the basal part consists of two joints, of which the upper one bears a gill and tuft of hair or setæ; the endopodite consists of five joints, and the exopodite is slender and ends as a long filament. The mouth of the crayfish leads by a short œsophagus into a stomach, armed with a series of crushing teeth, forming a "digestive mill"; from this a long straight intestine leads to the anus. The nerve system consists of a long chain of pairs of ganglia, united by a pair of nerves, cords, and transverse commissures. At the anterior end of the nervous system is the "brain," situated above the mouth, and giving off nerves to the eyes and feelers; a pair of "commissures" connect this to another nerve mass formed by the fusion of five

pairs of ganglia; behind this is a chain of twelve pairs of ganglia, extending to the end of the abdomen. Respiration is effected by a series of nineteen pairs of gills, while there are also three rudimentary pairs; these are contained in a large branchial chamber on each side of the thorax; the gills are borne either on the limbs (podobranchs), on the side walls of the thorax (pleurobranchs), or on the membranes between the bases of the limbs and the walls (arthrobranchs). The water is driven through the branchial chamber by a spoon-shaped plate (scaphognathite) on the base of the second maxilla. The heart is placed on the middle of the dorsal side of the thorax, and is enclosed in a large "pericardium"; the blood is colourless. The kidneys are a pair of green glands, situated just in front of the mouth, and each opening on a small tubercle on the antenna. The auditory organs are a pair of small sacs. containing a series of hairs and grains (or otoliths), situated in the base of the antennules. The crayfish is carnivorous in habit; it usually walks about on the walking legs, but can swim back rapidly by the action of the abdomen. Its name is *Astacus fluviatilis*.

Crayon (French *craie*, chalk), a pencil made of fine pipeclay, and usually coloured artificially. White crayons, however, are made of chalk, black crayons sometimes of a black kind of chalk. Sometimes the term is applied to a drawing made with crayons. In lithography, the crayon used for drawing on lithographic stones consists of soap, wax, resins, lampblack, melted or burnt together.

Cream of Tartar. During the fermentation of grape juice for the production of wine, crystalline crusts are deposited on the casks, consisting chiefly of *acid potassium tartrate* ($H_5KC_4O_6$), and known as *argol*. By dissolving this in hot water, filtering with charcoal, clay, or albumen, and then allowing the liquid to crystallise, *cream of tartar* is obtained. It is generally, however, impure, containing small quantities of *calcium tartrate*. It forms rhombic crystals, and is only slightly soluble in cold water. Hot water, however, dissolves it more readily; and an intimate mixture with borax is easily soluble in the cold, and is known as *soluble cream of tartar*. It finds various industrial uses, as in manufacture of potassium carbonate, in silvering, dyeing, etc., and in medicine. In small doses it is used as a diuretic, while taken in larger quantities it acts as an aperient and purgative.

Creatine, a substance of composition $C_4H_9N_3O_2$, which is found in the muscles of all vertebrate animals, and to a smaller extent in the nerves and blood. It may be obtained from flesh or "meat extract" by digestion with water and subsequent purification. It forms monoclinic crystals, which are slightly soluble in cold, and readily in boiling, water. By evaporating the solution with an acid, a substance *creatinine* is obtained ($C_4H_7N_3O$), which is found in urine.

Creation, the formation of a material universe by the exercise of the Divine Will. As a philosophical theory of cosmogony (q.v.) it conflicts, on the one hand, with the Oriental theory of emanation, according to which the world is a necessary product of the Divine nature; and with the modern view of evolution (q.v.) in some of its developments, as enunciated by some students of physical science, according to which the existing order is the necessary result of forces inherent in an eternally-existent matter or force. Both these theories appear to some extent to place a necessity above the Deity; the first in assuming another cause behind the First Cause, while evolution, though consistent with an original creative act, seems to involve a necessary sequence of cause and effect in subsequent production. "The whole creation," says Professor Huxley, "is the result of the mutual interaction, according to definite laws, of the forces possessed by the molecules, of which the primitive nebulosity of the universe was composed." This view throws back the question to that of the origin of force or motion. Yet St. Thomas Aquinas writes: "Only because creation was out of nothing, is God the First, Absolute, and Essential Cause of all things."

Entirely distinct from the question of the creation of the world are those of the interpretation of the six days of creation in the first chapter of *Genesis* and of the "special" creation of each species of plant and animal. As to the former question many diverse views have been held by orthodox thinkers. A long pause has been suggested between the creation of the heaven and the earth recorded in verse 1 and the creation of what is supposed to be the existing order of things described in later verses. Six periods of indefinite duration, corresponding, it is argued, to divisions of the geological record, has been a favourite view. Six visions from evening to morning vouchsafed to the inspired narrator is another suggestion; and, lastly and more metaphysical, six acts of the Divine volition, each possibly extending over a natural day of twenty-four hours, creating, not the actualities, but all future potentialities of nature. Heterodox interpreters look upon this cosmogony as merely the Hebrew guess at truth. As to this it is only necessary to make the obvious remarks; first, that the object of *Genesis* as of every other book in the Bible is clearly moral and not scientific, and that, therefore, even on the view of plenary inspiration only a general, perhaps rather a literary or poetical, correspondence with the teaching of science, is to be expected; and, secondly, that, as compared to every other cosmogony possibly older or contemporary or later and heathen, this Hebrew belief has at once a sublimity, a precision, a simplicity, and a reasonableness that are at least remarkable.

As to the belief, naturally entertained before the careful observation of the variability of animal and vegetable forms, that the innumerable kinds or "species" of plants and animals have been originally created each distinct from each and immutable, it is, in the words of Sir Joseph Hooker, "purely speculative, incapable from its very nature of proof, teaching nothing and suggesting nothing, . . . the despair of investigators and inquiring minds." Some form of the doctrine of descent

with modification is now held by almost every naturalist. [DARWINISM, EVOLUTION.]

Crebillon, PROSPER JOLYOT DE (1674–1762), a French tragic poet, born at Dijon, and educated by the Jesuits. He at first entered a procureur's office, but showed little aptitude for the calling, and was encouraged by his master to turn his attention to the theatre. His first effort, *Les Enfants de Brutus*, was a failure, but it showed his predilection for sombre subjects. He used to say that Corneille had monopolised Heaven, Racine Earth, and that only Hell was left for him. Accordingly in 1705 appeared *Idomenée, Atrée et Thyeste* in 1707, and *Electre* in 1709, to be followed by his masterpiece, *Rhadamiste et Zenobie*. His next work, *Xerxes*, in 1714, showed a falling-off. In 1717 he produced *Semiramis*, and *Pyrrhus* in 1726; and then he rested till 1748, when he produced *Catilina*. Being criticised as not giving Cicero sufficient prominence in this, he wrote *Le Triumvirat* in 1754. Crebillon seems to have been a man of modest and retiring disposition, and a somewhat melancholy turn of mind relieved by occasional gaiety. CLAUDE PROSPER JOLYOT DE (1707–1777), was the son of the above; his works were of a somewhat questionable nature. On the principle of "set a thief to catch a thief," he was appointed censor. Sterne speaks of having read his works.

Crêche (French *crêche*, a manger), originally a foundling hospital, so called from the manger in Bethlehem where Christ was laid. Afterwards the term was transferred to a sort of charitable nursery, at which mothers might leave their children during the day for a small payment while they are at work. Crêches of this sort are now common in England and America.

Crécy, a French town on the river Maye, in the department of the Somme, 12 miles N.E. of Abbeville. It is chiefly known as the place of the noted battle of Cressy (1346), in which Edward III., with 30,000 men, gained a signal victory over a far larger French force. The Prince of Wales's feathers and motto were adopted from the crest of the blind king of Bohemia, who fell in the battle. In this fight cannon were used almost for the first time.

Credence (really the table prepared, from the same root as *ready*, but not connected with creed), the small side table in the chancel of a church, on which bread and wine are set ready for consecration at the Holy Communion. The term was applied to sideboards in the Middle Ages, and the ecclesiastical use in England seemingly is due mainly to Archbishop Laud and Bishop Andrewes. Its legality has been disputed, but it has been sanctioned by the courts.

Credit, in economics and commercial life, the trust reposed in debtors which permits them to defer payment of money due from them, by giving written or other promises to pay either on demand or at some future date. A bank note, an I O U, a cheque, a bill of exchange, a debenture or Government bond, are all classed as forms of credit. Such instruments are of special value in trade—first, as facilitating payments to be made between distant places, without transmission of specie (even Government bonds "to bearer" are so used at times); secondly, as facilitating borrowing for commercial purposes, so that much wealth which the possessors cannot use profitably themselves can be applied to production by being lent to men with more ability or better opportunities; most of all, perhaps, as supplying a ready substitute for coin in periods of expansion of trade. Were there no such substitute, every improvement in trade would involve an immensely increased demand for coin; that is, coin would become scarce and rise in value, prices would fall, and the world would probably have to revert to the barter of our remote ancestors. By the use of such substitutes, provided confidence in the ability of the debtors to pay is unshaken, specie is practically dispensed with in wholesale trade, quite 99 per cent. of which is carried on with such substitutes. Though we find beginnings of a system of banking in Greece and even banker's drafts in Rome [BANKING], the modern system of credit is not much more than two centuries old. Doubtless it has disadvantages, and a "collapse of credit," leading to the sudden contraction of the circulation of the substitutes for money mentioned above, is but another name for a commercial crisis.

Credit, LETTER OF, a circular letter addressed by a banking firm to its correspondents in other countries, requesting them to pay a certain sum to the person named therein. Commonly this person is a traveller, who obtains the sum mentioned by instalments in different places as he may require. American travellers frequently carry such letters in Europe; English travellers more commonly, perhaps, use the variety of letter of credit called circular notes (q.v.).

Crédit Foncier, an institution, the primary object of which is to lend money on mortgage on the security of real property (French, *propriété foncière*). In Germany the first society of the kind was founded in 1770 in Silesia, to relieve the local landowners of their debts. It was a mutual society, the members being collectively responsible for the loans on mortgage made to each individually. In France a law regulating the formation of land mortgage companies was passed in 1852; but one society founded in that year, called the Banque Foncière de Paris, practically monopolised the field at once, and shortly changed its name to the Crédit Foncier de France. For a time under the Empire its chief officers were nominated by the Emperor. An offshoot, the Crédit Agricole, was founded in 1861, and a financial company, also called the Crédit Foncier of England, was founded in England in 1864, chiefly to finance public companies. The Crédit Mobilier of France lends on personal property. The Crédit Foncier of France has also undertaken other business, such as the promotion of companies, the raising of loans for Governments and municipalities, etc. For many years it supplied Baron Haussman with the wherewithal to beautify Paris. The humbler functions of such companies, as

originally projected, are performed in England to a great extent by building societies.

Crediton, on the Creedy, in Devonshire, a market town and borough eight miles N.W. of Exeter. It is in a valley between two steep hills, and consists of the old and the new town. There is a fine cruciform church with a central tower 100 feet high. St. Boniface, the Apostle of Germany, was born here. There were once woollen manufactures here. Most of the old houses were destroyed by fire during the last century.

Creeds (Lat. *credo*, I believe), formal confessions of the chief articles of the Christian faith, perhaps alluded to in 2 Timothy i. 13, and elsewhere in St. Paul's Epistles. Whether they are traceable in the Apostolic age or not, forms of Apostolic doctrine which have some resemblance to them are found in Irenæus, Origen, and Tertullian. The Apostles' Creed (q.v.) is given by Rufinus of Aquileia (390 A.D.) in two forms, one in use at Aquileia, the other at Rome. Its present form dates back to the eighth century. The Nicene Creed (q.v.) was put forth by the General Council of Nicæa in 325 A.D., and supplemented by a Council of Constantinople, A.D. 381, in a manner not recognised by the Western Church. The Athanasian Creed (q.v.) was probably composed early in the fourth century A.D. Primarily the creeds were repeated by catechumens at their baptism, but not used otherwise in public worship. The Nicene Creed was introduced into the daily offices of the Greek Church about 450 A.D., into those of the Western Church in 589 A.D. Turning to the east at the creed is probably connected with the idea of the east as the source of light and place of the sunrise.

Creeks, a North American people belonging to the Appalachian group, who call themselves Muscogulgi (Muskhoghi), and who form two great divisions, the Upper Creeks, or Muskhoghi proper, of the Upper Alabama, and the Lower Creeks, or Seminoles, of the Lower Alabama and Flint rivers; both originally from beyond the Mississippi. The Seminoles, who appear to be the original stock, were formerly the dominant people in Florida, where a few are still met. But the bulk of the nation are now settled in Seminole Reserve, Indian Territory. The Upper Creeks formerly occupied the present States of Georgia and Alabama, but were also removed (1836) to a reserve in Indian Territory. Here they have made considerable material and intellectual progress, and now possess numerous schools, periodicals printed in a special character, a political constitution, and two chambers, one for the "kings," and the other for the "warriors." Nevertheless, they appear to be decreasing, having fallen from 14,500 in 1866 to little over 12,000 in 1882. J. W. Powell (*Linguistic Stocks of American Indians*, 1891) separates Seminole from Muskhogean, and classes it with the nearly extinct Timuguanan stock language, at one time current throughout the whole of Florida.

Creeper, any bird of the family Certhiidæ (q.v.), and especially *Certhia familiaris*, the Common Creeper, widely distributed in Britain and in Europe. This bird, which is resident in the United Kingdom, is about five inches long; the plumage above is of various shades of brown, mixed with white, and the under surface is silvery white with a rufous tinge. It is usually found in woods and plantations or on old and isolated trees by the roadside, in the ascent of which, in its search for insects, it is materially aided by the stiff feathers of the tail. The nest is usually in a crack of a tree, and there are from four to eight eggs, which are white, more or less spotted with reddish-brown. The note is monotonous, and has been syllabled "twee-twee."

Crees, North American aborigines, one of the three north-western Algonquian nations, the two others being the Salteaux and the Maskegons. They call themselves Neyowock ("Men") and Iyinuvoh ("People"). Cree being an English contraction of Kristeno, which derives through Knisteno from Kenistenovoh, the name applied to them by the Blackfeet. They formerly occupied a vast territory stretching from Manitoba to the Rocky mountains, partly prairie, partly forest, whence the Prairie Crees, hereditary foes of the Blackfeet, and the Forest Crees, scattered groups of fishers and hunters. Their Algonquin dialect, almost the same as that of the Maskegons, but differing greatly from that of the Salteaux, has been reduced to written form both by the French and English missionaries, and is said to be the simplest of all Algonquin tongues. Many now speak English and French, and at various dates since 1871 they have disposed of most of their hunting-grounds to the Canadian Government. The Maskegons (Muscaigos) are the so-called "Swampy Crees," who roam between Lake Winnipeg and Hudson Bay, as far north as the Churchill river, where they are conterminous with the Chippewayan Athabascans. The Salteaux domain lies between the Mouse and the Lower Saskatchewan rivers south and north. All are decreasing and gradually disappearing before the white settlers. (*See* A. Lacombe, *Dictionnaire, etc., de la Langue des Cris*, Montreal, 1874.)

Cremation (Latin *cremare*, to burn to ashes), the disposing of dead bodies by burning instead of burial. This was the practice of the ancient Greeks and Romans, the Celts, the ancient Assyrians, the Hindoos, and other nations; it was probably adopted originally to save the bodies of those slain in war from maltreatment by an enemy, *e.g.* by cannibalism. The Greeks and Romans burnt their bodies on open pyres, generally with various perfumes, and the ashes were preserved in urns. But the practice was checked by the material view of the "resurrection of the body" taken by the early Christians. In 1874 Sir Henry Thompson, the well-known physician, suggested the revival of the practice on sanitary grounds. The Cremation Society of England was formed, and a crematory furnace erected near Woking, Surrey. The scheme excited violent opposition among a section of the clergy, and from doubts as to the state of the law (set at rest in 1884 by the charge of Mr. Justice Stephen) no steps were taken by the society to

perform cremations until 1885. A Bill, however, to legalise the practice was introduced into the House of Commons in 1884, but opposed by the Government chiefly on the ground that it would facilitate the concealment of murders, and defeated by 149 to 79. In 1885, however, the Cremation Society first publicly performed a cremation at Woking, and since then upwards of 200 bodies have been there dealt with. In 1889 the number was forty-six, in 1890 fifty-four, and in 1891 ninety-nine, including the bodies of Mr. Baron Huddleston and Mr. James Nasmyth (q.v.). Cremations, however, have taken place elsewhere in England. In 1769 the body of a Mrs. Pratt was burnt by her own wish in the Tyburn burying-ground. In 1883 and 1884 three cremations took place in a private crematory in Dorset, while a Dr. Pryce cremated his child on an open pyre in Wales. Cremation has been legalised in France, Germany, and Italy, and crematory furnaces now exist at Père la Chaise (Paris), Dresden, Gotha, Milan, Rome, and elsewhere. Cremation is opposed partly on grounds of sentiment, but mainly because it is feared that it would greatly increase the difficulty of detecting murders. Its advocates, however, reply that mineral poison would still be traceable in the ashes, while in suspicious cases the internal organs could be kept for analysis. They propose also that a "medecin verificateur" (as is usual in France) shall be appointed in every district to examine carefully into the causes of all deaths. The sanitary advantages of the practice are immense; the germs of zymotic diseases are, under the present method of burial, multiplied and diffused, and often pollute drinking water. Moreover, the waste of land in ordinary burial is serious. Chemically, burning effects in an hour or two what burial does in many years. In a cremation furnace the destruction of the body is effected by gas generated from the fuel used and then passed over the body. The gases from the body are passed through and under the fire before being carried out into the air, so as to secure effectual combustion. The process takes from an hour and a half to two hours.

Cremona, an Italian town, capital of the province of Cremona in Lombardy, on the N. bank of the Po, 46 miles S.E. of Milan. The town is well built and is surrounded by walls and ditches. Its churches have many paintings and frescoes, and the ancient cathedral is highly decorated. A thirteenth-century tower, the *Torazzo*, near the cathedral is 396 feet high, and commands a fine view. The town has a considerable river trade, and manufactures cotton, silks, porcelain, and earthenware. It was formerly noted for its violins.

Cremorne, gardens on the north side of the Thames in Chelsea, formerly a favourite place of amusement, but closed in 1877.

Creole (Span. *criollo*, a diminutive of *criado*, lit. created, a creature, a well-bred educated person), a term originally and properly applied to the whites of pure Spanish descent in the Spanish colonies; then adopted by the French (*créole*, whence the English form) in an analogous sense; later used loosely, especially by English writers, for any descendants of the Spaniards, French, and Portuguese, whether pure or mixed, where the white element predominates; lastly applied to blacks of pure descent (Brazil), to the issue of whites and Mestizos (Peru) and to Mestizos or half-castes generally (Alaska). Both in Spanish and Portuguese *criado* has the secondary meaning of servant or slave, which may explain the later confusion and baser use of the word. *Malcriado*, in Spanish and Portuguese, and *malcreato* in Italian, mean ill-bred, rude, unmannerly.

Creosote (CREASOTE or KREASOTE). This name was first applied in 1832 to a colourless liquid with a penetrating odour obtained by the distillation of the tar from beech wood. The name was also afterwards given to the *carbolic acid* obtained from coal tar, the two substances being supposed to be identical. "Creosote" is now generally applied as a generic term to those products of distillation of wood tar, coal tar, shale oil, etc., which consist largely of carbolic acid or compounds chemically analogous to it. Wood-tar creosote consists chiefly of *guiacol* ($C_7H_8O_2$) and *creosol* ($C_8H_{10}O_2$). It boils at about 205° to 220°, and acts as an antiseptic, its name being derived from its power of preserving meat from putrefaction (*creas*, meat; *sozo*, I save). Coal-tar creosote is a very important substance commercially, and is very largely used for "creosoting" timber, softening pitch, illumination, fuel, and as an antiseptic. It varies in composition, but generally consists chiefly of *carbolic acid*, *creosol*, *scylenol* ($C_8H_{10}O$), with dissolved solid hydrocarbons and basic substances. There are three pharmacopœial preparations of this drug, *Mistura*, *Argentium*, and *Vapor Creasoti*. The ointment is used in certain forms of skin disease. The vapour is used as a deodorant and disinfectant in cases where the breath is foul, in combination with iodine, ether, and chloroform. The vapour of creosote has been largely employed of late years in the antiseptic treatment of phthisis. Administered internally, creosote is employed to check vomiting. Locally applied, a drop of creosote is sometimes of service in alleviating the pain of toothache.

Crescent (Lat. *cresco*, to grow), the moon when "waxing," *i.e.* in her first two quarters; hence, anything of similar shape, specially applied to the Turkish standard, which was originally the standard of Byzantium, afterwards Constantinople, and was adopted by the Turks on their capture of that city in 1458.

Cress, the popular name (from the Teutonic, *kers*, *carse*) applied to a variety of plants mostly members of the order *Cruciferæ* (q.v.), with pungent, but wholesome, leaves. *Lepidium sativum*, seedlings of which are eaten as salad with those of mustard, and *Nasturtium officinale*, the watercress (q.v.), are especially so-called. The garden Nasturtiums (*Tropæolum majus* and *T. minus*), which are similarly pungent, though belonging to a widely different family, the *Geraniaceæ*, were formerly known as Indian cress.

Cresswell, The Right Hon. Sir Cresswell, born at Blackheath in 1794, and educated at the Charterhouse and Cambridge. was called to the bar at the Middle Temple in 1819. and joined the northern circuit. With Mr. Bramwell he compiled a valuable series of reports, and in 1830 became Recorder of Hull, being returned as Conservative M.P. for Liverpool in 1837. Sir Robert Peel appointed him in 1842 a Justice of Common Pleas, and sixteen years later he was selected to preside over the newly-constituted Divorce Court. He filled this exceedingly arduous post with conspicuous ability and tact, and his decisions form a solid basis of law built upon new and dangerous ground. In 1863, whilst in the full exercise of his powers, he unhappily met with a carriage accident, which terminated fatally.

Cresting, or Creste, in architecture, an ornamental finish to a gable, or to the summit of a roof.

Creswick, Thomas, R.A., was born at Sheffield in 1811, and, after beginning his artistic education in Birmingham, came to London at the age of 17. He was fortunate enough to attract early attention by a series of Welsh and Irish landscapes that gained admission to the Royal Academy and the British Institution. His work was remarkable for its faithful rendering of British scenery, and for the skill with which trees and foliage were reproduced. In 1842 he was elected A.R.A., and received full honours in 1851. Of the 265 paintings which he exhibited, the most noteworthy are *The Pathway to the Village Church*, now in the National Gallery; *A Scene on the Tummel* and *A Summer's Afternoon*, to be seen at South Kensington; *The Weald of Kent* (1843), *The Old Foot Road* (1846), *The Valley Mill* (1851), and *Across the Beck* (1864). He also illustrated with success Thomson's *Seasons*, Walton's *Angler*, Tennyson's *Poems*, and the *Book of British Ballads*. His death took place in 1869.

Cretaceous System, though taking its name from what is to us its most familiar rock, the Chalk (Latin, *creta*), varies very much petrographically. In Europe, when it was laid down, there were two areas of deposit: the southern, an open-sea area through the Mediterranean region into Hindostan, represented by massive limestone containing a remarkable group of pelecypod mollusks, the *Hippuritidæ* (q.v.); the north-western, a shallower water area, from Bohemia into Britain, represented first — in its lower half — by sands and clays containing phosphatic nodules (q.v.), and largely green from the presence of glauconite (q.v.), and subsequently—in the upper part of the series—by white chalk (q.v.). In the lower part the plant-remains resemble those of the subjacent Jurassic (q.v.) rocks; but in the upper, dicotyledons (q.v.) occur in considerable variety at Aix-la-Chapelle, in Dakota, and even in the north of Greenland. The chalk (q.v.) itself is largely composed of foraminifera (q.v.), of which *Globigerina* is one of the most abundant. Siliceous sponges were numerous, including *Siphonia* and *Ventriculites*, forming the nuclei of many of the flint (q.v.) nodules, bands of which characterise the Upper Chalk. Corals and crinoids were not abundant; but echinoids were especially so, including *Cidaris*, *Ananchytes*, *Micraster*, and *Echinoconus*. The brachiopods *Terebratula* and *Rhynchonella*, and the pelecypods *Ostrea*, *Exogyra*, *Pecten*, and *Inoceramus* were numerous, and in addition to the last of the belemnites and ammonites we have a remarkable variety of unrolled ammonitids, including *Turrilites*, *Hamites*, *Baculites*, etc. Among fishes, in addition to elasmobranchs, such as sharks and rays, there were during the later half of the period the earliest teleostean or true bony fishes. The chief reptiles were the huge terrestrial herbivorous dinosaur *Iguanodon* (q.v.) and the marine serpent-like *Mosasaurus*, besides the last pterodactyls and ichthyosaurs. No mammals are as yet known from Cretaceous rocks of the Old World, though some have been described in the United States; but in Kansas both ratite and carinate birds are represented by the toothed forms *Hesperornis* and *Ichthyornis*. In northern Europe the system is thus divided into series, named mostly from French localities:—

Upper. Danian or Maestrichtian. Absent in England. Faxœ in Denmark.
Senonian, or Upper Chalk, with flints, named from Sens.
Turonian, or Lower Chalk, without flints, named from Touraine.
Cenomanian, marly chalk and Upper Greensand, named from Mans (Cœnomanum), and
Albian, or Gault clay (q.v.), named from Aube.
Lower. Neocomian, named from Neuchâtel (Neocomum), represented in England by the upper part of the marine Speeton clay and the freshwater Wealden and marine Lower Greensand.

A slight unconformity and a marked palæontological break usually separates the Neocomian from the Upper Cretaceous. In India during this period the Deccan traps, 4,000 to 5,000 feet thick, over 200,000 square miles, were erupted. In the western United States Cretaceous rocks reach a thickness of 11,000 to 13,000 feet, and there and in New Zealand there seems to be no great break between them and overlying Tertiary rocks. In Britain and over most of Europe, on the other hand, the close of the Secondary period is indicated by a marked break at the top of the Cretaceous.

Crete (Gk. *Krētē*, Lat. *Creta*, Mod. *Candia*, Turk. *Kiaid*), an island in the Mediterranean, S. of the Greek Archipelago. It is about 160 miles long, E. to W., and has a breadth of from 6 to 35 miles, with an area of 3,300 square miles. Mountainous in the centre, the chief peak Upsilorites (the ancient Ida) rising to 7,674 feet, it possesses fertile plains and valleys watered by numerous springs which the winter rains swell into torrents. The coasts are indented and cavernous. Olives, oranges, lemons, raisins, wine, and silk are among the chief products, and sponges of the best quality are found off its shores. Crete was a thriving centre of Greek civilisation in pre-Homeric times. Minos, its mythological king, was famed as a law-giver and as the first creator of a navy. Homer speaks of its hundred cities. Brought under the Roman yoke by

Metellus, it was conquered by the Saracens in 823, bought by the Venetians in 1204, and annexed to Turkey after a long struggle in 1669. A succession of insurrections, followed by cruel persecutions, has marked its history since that period. Two-thirds of the population are Greek Christians, who naturally aspire to independence, and are treated with brutal severity by the Mussulman rulers. In 1841, 1858–9, and 1866–9, violent struggles have convulsed the island, and these efforts have been renewed as recently as 1890. The chief towns are Candia, the ancient Crete, Retimo, and Canea.

Cretin, Cretinism, words of doubtful etymology, said to be derived from the French *chrétien*, a Christian. A cretin is a person of feeble intellect and of peculiar and characteristic appearance. Growth is stunted, the skin coarse, the head large, and the bridge of the nose sunken, sometimes there is associated enlargement of the thyroid gland. Cretinism is common in the Valais, in other parts of Switzerland, and in Spain, Italy, and parts of Asia. In all these regions the condition occurs side by side with cases of goitre. Closely allied, too, to cretinism is the disease known as Mynoldema (q.v.). Virchow has formulated a theory that the pathology of the disease is essentially one of maldevelopment of the basal portion of the skull. On this hypothesis cretinism is present from birth. Others maintain that the cretin is not born a cretin but that the condition is acquired in childhood.

Cretonne (named from its first maker, a M. Créton), a term originally denoting a strong linen cloth, with the warp of hemp and the woof of linen thread, made in Normandy, but now applied to a strong cotton cloth, generally rather heavy, and unglazed, printed (usually on one side only) with decorative patterns, used for curtains, furniture hangings, etc.

Creuse, a department in the centre of France, deriving its name from its chief river, a tributary of the Vienne. It comprises the old province of Haute Marche, with parts of Berry and Limousin, and has an area of 2,150 square miles. Most of the surface is mountainous, and only adapted to the rearing of sheep and cattle. Chestnuts, fruits, potatoes, and barley are the chief vegetable products, and the mountains yield granite, building-stone, and coal in moderate quantities. There are mineral springs at Evaux. Guéret, the chief town, is an insignificant place.

Creuzer, GEORGE FRIEDRICH, born at Marburg in 1771, became professor of philology and ancient history at Heidelberg in 1804. His great work, *Symbolism and Mythology of Ancient Peoples, especially the Greeks* (1810–12), was severely criticised by Hermann, but spread his name throughout Europe. The Grand Duke of Baden made him a Privy Councillor. He resigned his chair in 1848, and died ten years later.

Creuzot, LE, an important manufacturing town in the department of the Saône-et-Loire, France, 14 miles S. of Autun. It derives its prosperity from the neighbouring coal-fields, and as early as 1777 had become the centre of large iron and glass industries. The great rise of the town dates, however, from 1837, when M. Schneider established here his locomotive factory, that has grown to be the most extensive enterprise of the kind in all France.

Crewe, a town in Cheshire, 34 miles S.E. of Liverpool. Formerly a plot of land in a township that took its name from Crewe Hall, the seat of Lord Crewe, the place sprang into importance fifty years ago, because it was the point at which five other great railway lines became connected with the London and North-Western system. The latter company established here works for the manufacture of locomotives and carriages, and a thriving settlement was soon called into existence. The population, amounting to about 20,000, is composed almost entirely of the company's servants.

Cribrilinidæ, a family of Bryozoa belonging to the order Cheilostomata (q.v.); they have the front wall marked by a series of radiating ridges and furrows. It includes several English species recent and fossil; the earliest English fossil species is from the London clay.

Crichton, JAMES, generally known as "The Admirable Crichton," was born at Elwick, Dumfriesshire, N.B., or at Cluny Castle, Perthshire, in 1560, being the son of the Lord Advocate of Scotland, who had married a descendant of the old Scottish kings. He was educated at St. Andrews, and at the age of 20 was reputed to be master of ten languages, besides excelling all his contemporaries in good looks, fencing, dancing, music, and every other accomplishment. He went to Paris, where his talent for debate and his athletic skill provoked warm admiration. Thence he travelled to Rome, and visited Venice and other towns, lecturing on Aristotle, and performing various feats. Aldus Manutius appears to have really admired him, but Scaliger regarded him with suspicion. At last he reached Mantua, and the duke appointed him tutor to his son, Vincenzo, a wicked young man, who, during the Carnival of 1582, stabbed his preceptor in the streets. The works attributed to him hardly give an idea of his commanding abilities.

Cricket, the national game of England, is an outdoor game played by twenty-two players, eleven a side. The game may be divided into three branches, *batting*, *bowling*, and *fielding*. The batsmen, of whom there are always two in at once, one at each end, have to defend against the bowlers their *wickets*, which consist of three stumps driven into the ground so that they stand 27 inches above the ground, and placed so that the ball cannot go between them; on the top of the stumps are laid the bails. The *bat* must not exceed $4\frac{1}{4}$ inches in width at the broadest part, and must not be more than 38 inches long; the wickets are pitched opposite to each other with a distance of 22 yards between them. At a distance of four feet from the wicket is marked a *popping-crease*, within which the batsman is said to be in his ground. The *ball*, not more than $5\frac{3}{4}$ oz. nor less than $5\frac{1}{2}$ oz. in weight, must measure not less than 9 nor more than $9\frac{1}{4}$ inches in circumference. The batsman scores by means

of *runs*, *i.e.* if he strikes the ball when bowled to him, and can run to the opposite wicket before the opposing side has time to knock off the bails with the ball, he scores one run. The side which scores the largest number of runs wins. A batsman may be "out" in various ways: (1) He may be bowled, when the bowler breaks through his defence and knocks the bails off his wicket; (2) he may be caught, when any fieldsman catches the ball directly off his bat before it has touched the ground; (3) he may be run out, when he fails to reach the popping-crease after a run before the bails are knocked off; he may be "l. b. w." (leg before wicket) when he interposes his leg between a straight ball and the wicket; he may be "h. w." (hit wicket) when the bowler drives him back so that he knocks off his own bails with his bat; he may be stumped, when both his feet and his bat are

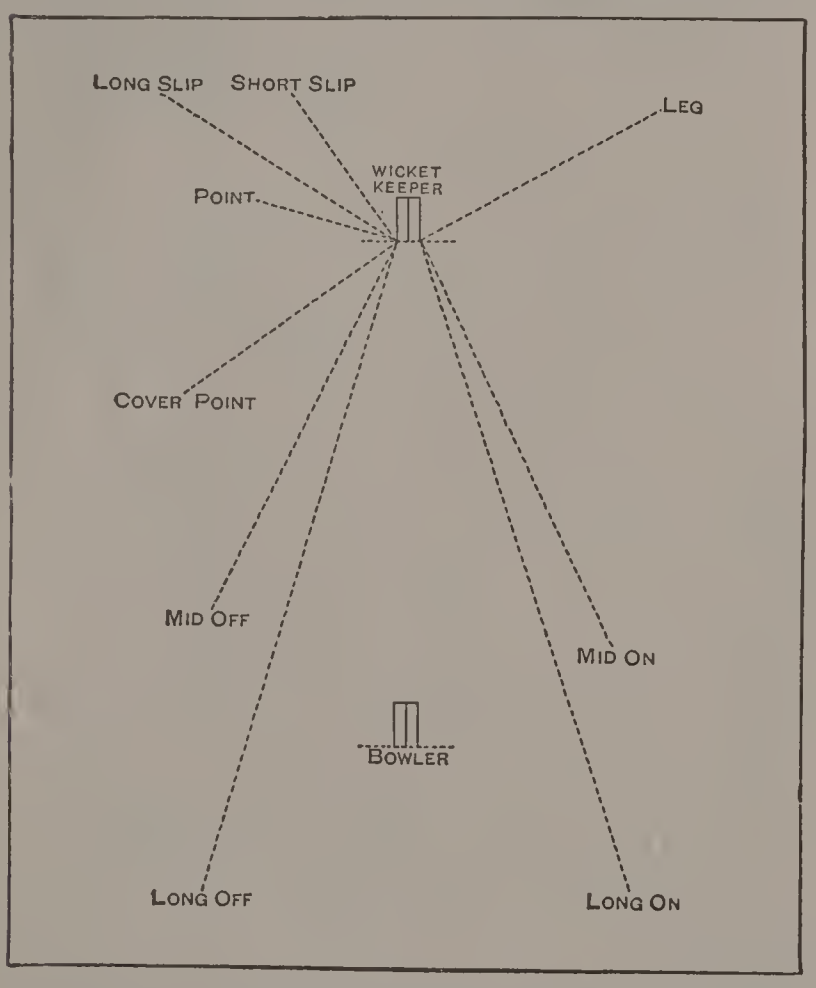


DIAGRAM OF FIELDSMEN PLACED FOR MEDIUM BOWLING, AS FOR LOHMANN OR ATTEWELL.

beyond the popping-crease and the wicket is put down while the ball is in play. Of batsmen who have earned great reputation in more recent years, W. G. Grace, A. G. Steel, Shrewsbury, Murdoch, Gunn, W. W. Read, and many others might be noted. The bowler delivers the ball with one foot within the bowling-crease (a line drawn on each side of the stumps), and he bowls five balls in succession, at the end of the five balls the bowling commences from the opposite end; each series of five balls is called an "over." The ball must be bowled, and if thrown or jerked is called a "no-ball," which counts as one run to the opposite side; if the ball falls so as to be, in the judgment of the umpire, beyond the batsmen's reach, it is called a "wide," and counts as one run to the other side. In former years a ball was counted a no-ball if delivered above the bowler's shoulder. Very fast bowling has, of late years, gone somewhat out of fashion. and at the present day, with a few notable exceptions, the best bowlers all adopt a medium pace, tending rather towards slow than fast. Among more celebrated bowlers of recent years may be mentioned Morley, Shaw, Lohmann, Briggs, Attewell, Peate, Spofforth, and Turner. Of the fieldsmen, whose positions naturally vary according to the character of the bowling or of the batsman. the wicket-keeper demands the first attention; he is always situated directly behind the wicket, which is being defended by the batsman and attacked by the bowler; this position calls for a very quick eye, as a wicket-keeper must be on the alert for balls which pass the batsman, both with the view of saving "byes" and stumping. *Point* is situated on the "off" or right-hand side of the wicket-keeper, frequently "square" with the wicket, *i.e.* in a straight line with the popping-crease, or sometimes rather behind the wicket. *Cover point* is generally placed behind point more towards the middle of the field; *mid-on* is on the opposite side pretty close in, between the two wickets; *mid-off* occupies a somewhat similar position on the off side but rather farther from the wicket-keeper; *slip* is a little way behind the wicket-keeper on the off side; *square leg* is on the on side, directly in a line with the batsman who receives the ball; *third man* stands between *slip* and *point*; *long-off*, *long-on*, *long-leg*, are simply placed far away from the wickets in the positions indicated. A *long-stop* (or fieldsman directly behind the wicket-keeper) is now rarely used, owing to the great improvement in wicket-keeping.

When ten men on one side have been got out, that side is said to have completed an innings; no side has more than two innings in a match. There are always two umpires in the field. whose duties are to see that the game is played fairly in every way.

Single wicket, a variety of the game played, as the name implies, with only one wicket, is seldom seen now-a-days.

In England first-class matches are generally limited to three days, and those which cannot be completed within that time are said to be drawn. County cricket has developed to a very large extent within the last few years, and of late the visits of the Australian teams have given an increased interest, if such were indeed wanted, to the national pastime

The origin of cricket is involved in a certain amount of obscurity, as it is evident that in very early times there existed various games with a bat and ball, but which particular one was the actual parent of cricket of the present day does not seem to be quite so clear. There is no doubt, however, that in Elizabeth's reign cricket as cricket was played by the youth of England. The forms of the bat and the wickets were somewhat different, but in all its main elements the game was the same. In the eighteenth century cricket was very popular, and many references to it have been found in the literature of the period; indeed, at this time one writer (1743) complains that it may be carried too far, that it fosters an undue mixing of the classes

with the masses, and "propagates a spirit of idleness." Nyren (b. 1764) published a *Cricketers' Guide*, and later the famous Lillywhite issued his *Handbook of Cricket*. It was this Lillywhite who practically introduced the system of round-arm bowling. The Marylebone Cricket Club, generally known as the M.C.C., which was founded about the beginning of the century, has done more to promote the welfare of cricket than any other institution. It is the M.C.C. which has framed and tabulated the laws by which the game is played the whole country through; any disputed point, any reform is brought before the M.C.C. and there dealt with by competent cricketers; moreover, by arranging for the visits of the Australians, by zealously promoting all county cricket, the M.C.C. has conferred a lasting boon upon all true lovers of the game.

There are, probably, few games existing which possess so truly national a character and which excite such universal interest in England as cricket. In the smallest village, in the busiest town, there will be found youthful cricketers who take as keen an interest in the scores of "W. G." as that champion himself, and there are very few Englishmen who do not watch with the greatest anxiety the progress of a match between England and Australia. The encouragement which is given to cricket at our schools and universities doubtless fosters this spirit to a considerable extent, but the love of cricket extends to all classes of Englishmen, and at the present day the writer of 1743 would doubtless have far more cause of complaint against the game for its tendency to unite the different classes of society.

Crickets, a group of insects belonging to the family *Achetidæ* and order Orthoptera. The best known English species is *Acheta domestica*, the common brown house-cricket. The largest British species is the Mole Cricket (q.v.), well known for its voracious habits. The New Zealand *Deinacridæ* are the largest living members of this group. Some species are wingless, and are ornamented like large woodlice.

Crillon, Louis, Duc de, was born in 1718, and served with distinction in the French army during the Seven Years' war. For some slight he then transferred his allegiance to Spain, and in 1780 recaptured Minorca from the English. He died in 1796. His son (François Félix), after fighting under his father, returned to France, and took an active part as a moderate Constitutionalist in the early events of the French Revolution. He was one of the founders of the Club des Feuillants. He escaped death in the Reign of Terror, and was made a peer of France after the fall of Napoleon.

Crillon, Louis des Balbes de Berton de, came of Piedmontese family, and was born in 1541 at Murs in Provence. He won a name for undaunted courage under Henry II., Francis II., Charles IX., Henry III., and Henry IV. He fought at Lepanto under John of Austria, accompanied Henry III., then the Duc d'Anjou, into Poland, and supported him against the League, but refused to countenance the St. Bartholomew Massacre. The title of Colonel-General of Infantry was invented for him. He was a great favourite with Henry IV., who wrote to him from the battle-field—"Pends-toi, brave Crillon! Nous avons combattu à Arques, et tu n'y étais pas." He died at Avignon in 1615.

Crime. A crime is a public wrong, that is, a wrong done to the community at large (as distinguished from a *tort* or wrong done to an individual), and comprehends all acts amounting to treason, felony, or misdemeanor. The distinction of public wrongs from private—of crimes from civil injuries—seems upon examination chiefly to consist in this, that private wrongs or civil injuries are an infringement or privation of the civil rights, which belong to individuals considered merely as individuals, while public wrongs, that is, crimes and misdemeanors, are a violation of the same rights considered with reference to their effect on the community in its aggregate capacity. As if A detains a field from another man B, to which the law has given him a right, that is a civil injury and not a crime, for here only the right of an individual is concerned; and it is immaterial to the public which of them is in possession of the land. But treason, murder, and robbery are properly ranked among crimes, since, besides the injury done to individuals, they strike at the very root of society, which cannot properly exist where acts of this sort are suffered with impunity. In all cases crime includes an injury, that is, every public offence is also a private wrong, for while it affects the individual, it affects also the community. Thus, treason in imagining the sovereign's death involves in it conspiracy against an individual, which is also a civil injury, but as this species of treason in its consequences principally tends to the dissolution of government and the destruction thereby of the order and peace of society, this raises it to a crime of the highest magnitude. Murder is an injury to the life of an individual, but the law of society considers principally the loss which the State sustains by being deprived of a member, and the pernicious example thereby set to others. Robbery is an injury to private property, but were that all, a civil satisfaction in damages might atone for it. The public mischief is the thing for the prevention of which our laws make it a felony. In these gross and atrocious injuries the private wrong is absorbed in the public, and that is why we seldom find any mention made of satisfaction to the individual in such cases, the satisfaction required by the community being so great. But there are crimes of a lower kind, in which the public punishment is not so severe, such as battery or assault, in which the aggressor may either be indicted and punished by fine and imprisonment for disturbing the public peace, or the injured party may have his private remedy by a civil action for damages. So in the case of a public nuisance as digging a ditch across a highway, this is also punishable by indictment; and if any individual sustains special damage thereby as by laming his horse, breaking his carriage, etc., the offender may be compelled to make ample satisfaction as well for the private injury as for the public wrong. And thus the law has a double view in its cognisance of wrongs, viz.

to redress the party injured by restoring to him his right, or by giving him an equivalent, and to provide for the public benefit by preventing or punishing every breach or violation of those laws, which the sovereign power has thought fit to establish for the government and tranquillity of the State.

Crimea (Lat. *Chersonesus Taurica*, Russ. *Krym*), a peninsula jutting from the S. coast of Russia into the Black Sea, which it divides from the Sea of Azov to the E. It is connected with the mainland by the Isthmus of Perekop, about 6 miles wide, and is separated from the Caucasian provinces by the narrow straits of Kertch and Yenikaleh. Rhomboidal in form, with an irregular projection, the promontory of Kertch, it measures 125 miles N. to S. by 200 miles E. to W., and has an area of about 10,000 square miles. The northern portion is a continuation of the Russian steppes, but to the S. volcanic mountains rise to 4,000 or 5,000 feet. The few rivers are mere torrents. The climate on the whole is favourable, though droughts prevail in summer, and the winters bring rain and wind. Cereals grow, but not extensively, the chief products being wine, fruits, flax, tobacco, and timber. The excellent pastures support numbers of cattle, horses, and merino sheep. Wild-fowl and fish are abundant. Salt is the most valuable export. The population consists mainly of Tatar Mohammedans, but Greeks, Russians, Armenians, Gypsies, Karaim Jews, and Germans monopolise the trade. The peninsula forms part of the Taurida government, and Simferopol is the capital, a well-built and fairly prosperous town. Sebastopol possesses a magnificent harbour, fortified by Catherine II., destroyed by the allies in 1855, and since reconstructed as a great arsenal and military port. It is now connected by railway with Simferopol and the mainland. Kertch, strongly fortified, is the centre of the cattle and grain trade; Eupatoria exports most of the salt; Yalta is a favourite watering-place; Baghtchascrai and Kara-son-Bazar are reserved for Tatars. The Tsar has an oriental palace near the former town, and a fine marine palace at Yalta. The Crimea was occupied in prehistoric times by a Cimmerian race, who in the seventh century B.C. were driven out by the Scythians, a remnant only under the name Tauri being left among the caves and mountain fastnesses. These were the worshippers of Artemis referred to in the Homeric legends. Heracleote Greeks founded in 658 B.C. a colony almost on the site of Sebastopol, which existed until 1363 A.D. Other Greeks settled in the land, and ultimately established the kingdom of the Bosphorus, which was ceded to Mithridates, and held under Roman protection by his son Pharnaces. The Alans, Goths, Huns, Khozars, and Kiptchaks, successively overran the country, and Venice and Genoa had settlements there. Then a Tatar Khanate was founded in the fifteenth century, but was speedily made tributary to the Sultan, and was finally annexed by Russia in 1783. The Crimea is specially interesting to Englishmen as having been the scene of the war of 1853–56, in which so much blood and treasure were wasted. The localities made memorable by that struggle, Alma, Tchernaya, Balaklava, and Inkerman, are treated of under their respective heads.

Crimean War, THE, between Russia on the one side, and England, France, and Turkey, and later Sardinia, on the other, broke out in 1854, and lasted until the final evacuation on July 12th, 1856. There can be no injustice in saying that the real cause of the war was Russian ambition, though the ostensible motive on Russia's part was the protection of the Christians who were under Turkish rule. As far back as 1844 the Czar Nicholas had proposed to enter upon the "sick man's" possessions and divide them. When the English and French declared war on the 28th March, 1854, Osman Pasha had been holding out bravely on the Danube, and when the allied troops had lain for a time at Varna, where they suffered greatly from cholera, it was concluded that there was no real need for their presence there, and, in accordance with a resolution to carry the war into the Crimea, a landing was made on the 14th of December by an army of 25,000 English troops under Lord Raglan, about the same number of French troops under Marshal St. Arnaud, and a Turkish contingent of 8,000, which army was increased in 1855 by the arrival of the Sardinian force. After forcing the passage of the Alma, the attacking army made a flank march, and were met by the Russians in force at Balaklava, an English fleet following the march along the coast. The battle of Balaklava is chiefly notable for the brilliant but disastrous Light Cavalry charge, which, by its mistaken object and untoward result, quite put into the shade an equally brilliant Heavy Cavalry charge earlier in the day. After the battle of Balaklava, the allies proceeded to invest the strongly fortified town of Sebastopol from the land side, while the English fleet blockaded and attacked it from the sea, the Russian fleet in the meantime finding shelter in the harbour, the entrance to which was blocked by the sinking of some stone-laden ships across the mouth. While the war was in this way carried on in the south, a fleet had been sent into the Baltic in the spring of 1854. The Russian fleet did not venture to give battle, but sought shelter behind the fortresses of Cronstadt and Sveaborg. The only work accomplished by the British fleet was the storming and taking of Bomarsund and of the Aland Islands. A second campaign in 1855 in this direction resulted in the bombardment and partial destruction of Sveaborg. A third battle in the south —Inkerman—was fought upon the 5th of November, 1854, in which the British eventually, aided by the French, held their own for some time against and finally repulsed a greatly outnumbering force of Russians, who had made a determined sally under cover of the dark November morning. Then followed a terrible winter of privation and suffering for the besiegers, who returned from severe work in the trenches to find a camp ill-provided with the simplest necessaries of life, and a totally inadequate organisation for the treatment of the sick and wounded. Private enterprise did much to make up for official shortcomings, and many a Crimean soldier had reason to thank the

thoughtfulness that provided him with warm clothing and a few simple luxuries, and the devotion of Florence Nightingale and her heroic band of nurses. The siege lingered on till September, 1855, when the storming of the Malakoff fort by the French, and the not altogether well-managed attack upon the Redan by the British, led to the retreat of the Russians from the town. The peace of Paris was concluded on the 30th of March, 1855. Upon the Russian side the most important result achieved was the surrender of Kars after a noble defence by General Williams and a Turkish force. The present British occupation of Cyprus has for one of the conditions of its cessation the restoration of Kars. One condition imposed upon the Russians by the peace of Paris was that they should not construct a Black Sea fleet. but this condition Russia, in 1871, declared her intention of repudiating. The Crimean War has been considered by some a huge political blunder from beginning to end; but it had, at any rate, some good results—it showed how utterly a peace of forty years had thrown our military supply organisation out of gear, and so led the way to those improvements which, all inadequate as they are, have put us upon a somewhat better footing for facing a European foe; it led to a total revolution in hospital arrangements—a change much needed, for the great majority of deaths in the Crimean War were the result of deficient hospital arrangements; and it put us in a better condition for coping with the Sepoy mutiny which followed immediately upon the Crimean War. The most elaborate history of the war is that of Kinglake, but it is much too cumbrous to give a comprehensive view, since it is not till the fifth volume that Inkermann is reached, and one reads 100 pages before reaching 8 o'clock in the morning of that eventful November day.

Criminal Conversation, the name of an action formerly in use and by which a husband sought damages sustained by him in the seduction of his wife. The action was abolished by a statute of the present reign, but the husband may now petition the Probate and Divorce Division of the High Court for damages in such a case without asking for a divorce also.

Criminal Information. [Information.]

Criminal Law. [Justice, Courts of.]

Crimp, one who entices sailors and plunders them under pretence of hospitality or otherwise. Several foreign ports are notorious for the prevalence of this evil, as San Francisco, New Orleans, and New York, where crimps have a certain political power, which renders interference with this detestable practice very difficult.

Crinan Canal, The, cutting through the peninsula of Kintyre, Argyllshire, and connecting Loch Fyne with the Sound of Jura, was made in 1793–1801. It is nine miles in length, has fifteen lochs, and is navigable by vessels of 200 tons burden. Ardrishaig is situated at its E. entrance, and Port Crinan, with its lighthouse, stands at the other extremity.

Crinoidea. The Crinoids or Sea Lilies are a class of Echinodermata (q.v.), which have recently been defined in the language of modern biology as caliculate. actinogonidiate, statozoic, pelmatozoic, and possibly apelmatozoic Echinoderms. All this simply means that the Crinoids are animals which belong to the group of the Echinoderms, that they generally possess a stem by which they are fixed at least at one stage of their existence. that their reproductive organs are arranged radially, and that the body is lodged in a cup formed typically of ten plates arranged in two circles. The only living Crinoid that is met with on the British coast is the "Rosy Feather Star," or *Antedon*, for a figure and description of which see *ante* vol. i. pp. 143–4. This is not, however, a good representative of the class, as it is fixed only in its larval stages while the adult is free-swimming. A typical Crinoid, such as *Pentacrinus*, consists of three main parts—a crown, a stem, and a root. The crown is the most important part, and contains the viscera; it consists of the calyx and the arms; the part of the calyx below the bases of the arms is known as the dorsal cup, and is typically composed of ten plates placed in two circles of five each; these are the basals and radials. In many Crinoids there is also a third ring of plates below the basals, and therefore known as underbasals; in the *Eugeniacrinidæ* and some others the basals are rudimentary, while in others, such as *Platycrinus*, the basals are large but only three in number. Above this radial ring of plates there is often a series of additional plates, of which some are placed above the radials while others occur above the angles between them; these are known as interradials. The plates above the radials are continued up to form the arms, which may be simple and five in number, or they may be any multiple of five formed by the branching of the radial series. The arms are composed of numerous small ossicles, which are grooved on the upper side; along these grooves the food is carried by currents of water to the mouth; the arms bear smaller branches known as pinnules, and in these the generative products are formed. The mouth is situated at the centre of the upper surface, and to it the five food grooves converge; the mouth opens to a short-coiled œsophagus or "gut," and the anus is also on the upper or oral surface. The mass of the soft tissues of the body enclosing the digestive system, etc., is situated within the calyx, and is known as the disc. Below it, just above the stem, is the "chambered organ," from which five cords pass up into the arms; the function of this structure was long uncertain, but it is now known to be the nerve centre, and the cords proceeding from it are the nerves. The stem is composed of a number of separate joints or ossicles united end to end; in section they are round, oval, pentagonal, or stellate; most of them are so loosely connected together as to allow the stem to be flexible; most stems bear side branches or cirri. The stem may be of great length, and in some Jurassic crinoids was as much as sixty feet high. In other cases it is short, or it may be suppressed as in *Holopus* or thrown off during development as in *Antedon;* in some it was extremely slender and wound round

corals or the stems of other Crinoids. The root may be either encrusting as in the Oolitic *Apiocrinus* or spindle-shaped or branched, or the crinoid may anchor itself by the lowest whorl of cirri. The Crinoids are a very ancient class, as they commenced in the Cambrian system. Their stems are very commonly found as fossils, and whole masses of limestone are sometimes composed almost entirely of them; such is the Grey Carboniferous Limestone of Derbyshire. They are gregarious, and are now mainly restricted to the deep seas; and consequently were once very seldom met with. It was, therefore, generally thought that the class was becoming extinct, but later explorations have shown that they still occur in vast numbers forming large forests in the deeper seas. The Crinoids are all marine.

Crinoline (Lat. *crinis*, hair, *linum*, flax), a kind of hair-cloth used for stiffening underskirts of women and making the dress bulge out. In and about 1860 the name was applied to the magnified mousetraps composed of narrow bands or wires of steel, which hid all female grace by transforming a woman into an awkward, ungainly balloon. Those of us who do not recollect them may get a clear idea of some of their features, and the awkward mishaps they gave rise to, by studying the engravings in *Punch*, where Leech so faithfully mirrored passing customs and fashions.

Crisiidæ, a family of Cyclostomata (q.v.), in which the colony (Zoarium) is branching, consists of a series of jointed segments, each of which is composed of one or two series of tubes. *Crisia cornuta* (Linn.) or the "Goat's Horn Coralline" and *Crisia eburnea* (Linn.) or the "Tufted Ivory Coralline," are the two best known English species of this family.

Crispin and **Crispinian,** two brothers born at Rome in the third century A.D. They embraced Christianity, and to avoid the persecutions under Diocletian, fled into Gaul, where they accompanied St. Denis to Soissons. They preached by day, and made shoes by night, the leather being supplied, according to one account, by an angel, according to another by theft. They were beheaded, it is said, in 287, and October 25th is kept as their day, being the anniversary also of the battles of Agincourt and Balaklava. They are the patrons of shoemakers.

Critchett, GEORGE, was born at Highgate in 1817, and after being educated at the London Hospital, became a member and subsequently a Fellow of the Royal College of Surgeons. Until 1846 he remained on the staff of the hospital engaged in general surgical practice, but in that year he took an appointment at the Ophthalmic Hospital, Moorfields, and thenceforward became known as one of the ablest specialists for diseases of the eye. Until just before his death, in 1882, he enjoyed unrivalled fame as an operator, and his lectures on "Diseases of the Eye" are still in high esteem. In private life he was very popular owing to his genial disposition, artistic tastes, and fondness for outdoor sports.

Critias, the Athenian orator, poet, and statesman, was a relative of Plato, and a pupil of Socrates. He appears to have devoted himself to intrigues in Thessaly and at home, with the result that he was exiled in 406 B.C. Returning with Lysander he became one of the *Thirty Tyrants*, and put to death Theramenes and others. He was killed in 404 whilst resisting Thrasybulus.

Critical Angle, in *Optics*, is the greatest angle to the perpendicular, at which rays of light can be refracted from one medium to another. Critical angles only exist when light passes from one medium to another in which its speed is greater, as, for example, when it passes from water to air. The critical angle in this case is about $48\frac{1}{2}°$; for crown glass to air it is $40\frac{1}{2}°$. [LIGHT, REFRACTION.]

Critical Temperature, in *Physics*, is that temperature for any special gas, above which it cannot be liquefied, however great the pressure to which we subject it. Every substance may, therefore, be regarded as truly gaseous at temperatures above the critical point. Thus, the critical point for carbon dioxide is 30·9° C., a result obtained in 1869 by Dr. Andrews, to whom much of our knowledge of this subject is due. The critical points of hydrogen, oxygen, and nitrogen are all very low; hence, at ordinary temperatures they may be well called permanent gases. [LIQUEFACTION.]

Croatia forms, with Slavonia and the districts formerly known as the Military Frontier, a Crown Land in the kingdom of Hungary and empire of Austria. The total area is 16,785 square miles. This region is bounded N. and N.E. by Hungary, N.W. by Carniola and Styria, S. by Servia, Bosnia, and Dalmatia, and W. by Dalmatia and the Adriatic. It has a coast-line of about 84 miles, but very few harbours. It is divided physically into two sections, (1) the basin of the Danube with its tributaries, the Drave, and the Save, and (2) the mountainous tracts, prolongations of the Alpine and the Karst systems, that stretch along the coast. The numerous rivers are liable to disastrous floods, and expand into broad marshes. The climate is mild, but the maritime portions are affected by the blighting Bora. Corn, maize, millet, flax, hemp, tobacco, grapes, plum-brandy, and silk are produced in the valleys, whilst the mountain forests yield plenty of timber, and small quantities of coal, iron, silver, copper, and lead. The country is now being opened up by railways. Originally part of the Roman province of Pannonia, Croatia, and Slavonia were conquered by Slavs in the seventh century, became an independent kingdom in 900 A.D., and were attached to Illyria from 1767 to 1777, and afterwards passed into Hungary. There is, however, a bitter enmity between the Croats and the Magyars, which has led to frequent disturbances. Since the 7th century Croatia has been almost exclusively inhabited by a people belonging to the Serb, or southern branch of the Slav family (Yugo-Slavs). They came originally from beyond the Carpathians, whence their name, Charpati, Charvati, Hrvati, Croati, meaning "Highlanders." (For the transposition of *r* compare *third* with

three and the A. S. thridde.) But in their legendary history the name is referred to Khrobat, Horvat, one of the mythical five brothers under whom they left their northern homes on the invitation of the Emperor Heraclius, and migrated southwards. Here they subdued and expelled the Avars of Dalmatia and the Save Valley, and were soon joined by the Terbuni, Narentani, and other kindred Serb tribes, from Lusatia and the Vistula. All these form the substratum of the present Slav populations south of the Danube. The Croatians accepted Christianity in 638, and about 990 formed the powerful kingdom of Croatia, which included Dalmatia, but which was conquered by the Hungarians in 1091, whence the title of "King of Croatia and Dalmatia," since borne by the sovereigns of Hungary. The Croatians differ little from their Servian neighbours in speech, appearance, or other respects, except that the former are Catholics and use the Roman alphabet, while the latter belong to the Greek Church, and use the Slavonic alphabet of Cyril and Methodius.

Crochet (French, *a hook*), a kind of open work in thread or other material, hand-made by means of a needle fixed generally in a bone or ivory handle, and fashioned at the end into a small hook for drawing the thread through the loops and interstices. Crocheting is not perhaps now so universal a feminine accomplishment as it was a few years ago.

Crocidolite, a hydrous silicate of iron, sodium, and magnesium, occurring in fine, tough elastic fibres, like asbestos. It is of an indigo blue colour, and has a hardness of 4 and specific gravity, 3·2. In the Asbestos Mountains of Griqualand it occurs as an enclosure in quartz, forming the chatoyant mineral known as *South African blue catseye*. It is also in the same locality commonly more or less completely altered into a golden-brown limonite or hydrous iron-oxide, forming the brown and green catseyes. Unfortunately this beautiful mineral, now largely used for umbrella-handles, jewel-cases, and other small ornaments, has been tastelessly dyed a variety of hues.

Crockets, derived from the idea of *hook*, and also connected with the idea of a *lock of hair*, are in architecture ornaments often to be found on gables, pinnacles, and the like, where they sometimes take the form of recurved leaves, with sometimes additional ornament. They are also used as ornaments upon the convex part of the crook of a pastoral staff.

Crocodile, a book name for any individual of the order Crocodilia, specially applied to the genus Crocodilus, constituting a family (Crocodilidæ), the other members of the order forming the families Alligatoridæ and Gavialidæ. [ALLIGATOR, GHARIAL.] Crocodiles, in the first and wider sense, are large lizard-like amphibious reptiles, with a crested tail which forms a powerful swimming organ. The body drags more or less on the ground; there are four short stout limbs, webbed partially or completely, with five digits on the fore-legs and four on the hind, and the back, and in some cases the abdomen, is covered with bony scutes. The teeth are in a single row, set in sockets and hollow at the base, to receive the germs of the new teeth, by which the old ones are from time to time pushed out and replaced. The tongue is flat, and fixed to the base of the mouth, thus giving rise to the erroneous notion that these animals had no tongue. At the back of the mouth are two transverse membranes, which stop the passage of water down the throat when the prey is held beneath the surface to drown. The heart has two auricles, and the ventricle is divided, thus making the heart four-chambered and bringing it up to the level of that of birds. The nostrils lie close together at the extremity of the snout, and can be closed

CROCODILES. (*C. vulgaris.*)

by valves, as can the ears, and a nictitating membrane protects each eye. The lacrymal glands are large, and the copious secretions therefrom have given rise to the notion of "crocodile's tears," and the epithet "crocodilian" has been coined to describe deceitful sorrow, from the old belief that the crocodile shed tears to lure man to his doom. All are oviparous, and the eggs, about the size of those of a goose, are laid in holes in the sand. The order dates from Triassic times, and is divided into two sub-orders:—(1) Procœlia (having the vertebræ concave in front), including all living forms and extinct genera from the Chalk onward; and (2) Amphicœlia (having the vertebræ concave at both ends), including all the extinct genera up to the Chalk. Examples of Alligators, Crocodiles, and Gharials occur in the Eocene beds of the south of England. The genus Crocodilus (True Crocodiles) contains twelve species (some of which have been unnecessarily raised to generic rank), widely distributed in tropical regions. They are found in all the rivers of Africa, and frequent the shores and estuaries of India and Siam, ranging to North Australia, and four of them inhabit the West Indies and Central and South America. The head is longer than that of the alligator, and the fourth tooth in the lower jaw bites into a groove in the

upper, and so is visible when the mouth is closed. The hind legs have a kind of scaly fringe, and the toes are completely webbed. Most species are entirely fluviatile, but some frequent brackish water, and two or three take to the sea. They feed largely on fish, especially when young, when full-grown on the smaller mammals, and sometimes successfully attack man himself. The Nilotic Crocodile (*C. vulgaris*) is widely distributed in Africa, and is said to attain a length of thirty feet; specimens of half that length are in the Natural History Museum, South Kensington. It was worshipped when alive and embalmed when dead by some of the ancient Egyptians, though others "made them an article of food." A plover (*Pluvianus ægyptius*) lives in a kind of companionship with the crocodile, clearing its body and. according to Herodotus, its throat of parasites, and warning it of danger by loud cries. The skin, which is tanned for leather, the fat, and the musk-glands of the lower jaw are articles of commerce. *C. cataphractus* and *C. niger* are both from the west coast of Africa; the former has a very long thin snout, while the head of the latter is short and broad like that of an alligator. *C. porosus*, the Salt-water Crocodile, has many of the characters of the common species, and ranges from India to the Fiji Islands and Australia. *C. bombifrons*, the Marsh Crocodile, often miscalled an alligator, is worshipped in Sind. Other species are the Siamese and Pondicherry Crocodiles (*C. siamensis* and *C. pondicherrianus*); the Australian Crocodile (*C. johnstoni*), with a long slender, conical snout; *C. acutus*, from Central America and the West Indies, somewhat resembling the extinct Teleosaurs in the shape of the snout; and the Cuba Crocodile (*C. rhombifer*), distinguished by its convex frontal region.

Crocoisite, an orange or red mineral, which is found chiefly in the Ural and Brazil. It forms crystals of the monoclinic system, and consists of lead chromate ($PbCrO_4$).

Crocus, a familiar genus of plants belonging to the Iris family, the numerous species and varieties of which are mostly natives of Southern Europe and Asia Minor. Two species, the autumn flowering *C. nudiflorus* and the spring flowering *C. vernus*, are naturalised in some parts of England. Crocuses have fleshy corms with buds on their summits; grassy leaves, enlarging after the flowering; a subterranean inferior three-chambered ovary; a long perianth tube surmounted by a funnel-shaped perianth of six nearly equal segments; three included epipetalous stamens; and a style dividing above into three dilated stigmatic lobes. The deep orange-coloured stigmas of *C. sativus* constitute saffron (q.v.). Though some flower in autumn, crocuses are specially valued in gardens as among the brightest and earliest of spring flowers. The so-called autumn crocus or meadow saffron is an entirely different plant with six stamens and a superior ovary. [COLCHICUM AUTUMNALE.]

Crœsus succeeded Alyattes as King of Lydia about 578 B.C. His wealth and prosperity, followed by irretrievable disaster, served Herodotus as one of his finest illustrations of the power of Nemesis. He made himself master of the Greek cities in Asia, and his court was visited by many learned men, including Æsop and Solon. From the latter the king heard the celebrated apophthegm, "Call no man happy before his death." Misfortune set in with the death of his favourite son by the involuntary hand of Adrastus. Then came his utter defeat by Cyrus, and his narrow escape from death at the stake, the saying of Solon, and the interference of Apollo, being the agencies that saved him. He was an honoured guest at the court of Cyrus and of his son Cambyses for some years, though he seems to have offended the latter. Nothing is recorded as to his death.

Croft, WILLIAM, born in Warwickshire in 1677, was educated by Dr. Blow, the famous organist of the Chapel Royal. He succeeded his master in 1708, holding also a similar appointment in Westminster Abbey. In 1715 he received the degree of Mus. D. from the University of Oxford. He published a work entitled *Divine Harmony* in 1712, and his *Musica Sacra*, containing several of his anthems and his famous Burial Service, appeared in 1724. Several specimens of his church music were published after his death in 1727, and we have a few concerted pieces by him of a secular character.

Croker, JOHN WILSON, though of English blood, was born in county Galway, Ireland, in 1780, and, after receiving his education at Trinity College, Dublin, was called to the Irish bar in 1802. One or two satirical pieces from his pen attracted early notice, but in 1807 he revealed more serious aims by advocating Catholic emancipation in a pamphlet entitled *The State of Ireland, Past and Present*. Next year saw him M.P. for Downpatrick, and by judiciously defending the Duke of York in 1809 against Colonel Wardle, he secured for himself the snug post of Secretary to the Admiralty, and held it for twenty years, when he retired on a pension of £1,500 per annum. Meanwhile he continued to sit in Parliament, where he opposed the Reform Bill of 1832, and, indeed, most other progressive measures, with ability, vigour, and often with bitterness. His pen was, however, more rancorous than his tongue, and the old volumes of the *Quarterly Review*, which he helped to found, contain many fine specimens of his harsh and acrimonious style. Croker was a literary man as well as a politician, and unhappily he carried the same offensive spirit into this field, provoking severe retaliation from Macaulay and the Whigs. His edition of *Boswell's Life of Johnson*, and the matter which he collected for an edition of Pope, show industry and critical ability. He deserves praise, too, for reproducing several volumes of interesting memoirs and letters dealing with the Georgian period, for helping to establish the Athenæum Club, and for consistently supporting grants in aid of art in the House of Commons. He died at Hampton in 1857, having somewhat outlived his reputation even with his own party.

Croker, THOMAS CROFTON, born at Cork in 1798, and brought up to business, obtained, through his namesake John Wilson Croker, a clerkship in

the Admiralty. Thus provided for, he devoted himself to that particular branch of archæology in which he won his fame. In 1825 he published the *Fairy Legends of the South of Ireland*, and this was followed by *Legends of the Lakes*, *Popular Songs of Ireland*, and an original and humorous sketch called *The Adventures of Barney Mahoney*. For the Camden and Percy Societies, which he helped to found, he wrote more serious papers on the social and political state of Ireland in the latter part of the seventeenth century, and he was an active supporter of the Hakluyt, Archæological, and Antiquarian societies. He enjoyed considerable reputation as a brilliant conversationalist, and died in London in 1854.

Croll, Dr., geologist, was born at Little Whitefield, Perthshire, in 1821. He was apprenticed to a millwright, but when twenty-four his health compelled him to leave that employment. When thirty-two he became an insurance-agent, and in 1859 he was appointed keeper of the Andersonian University and Museum at Glasgow. In 1867 he joined the Geological Survey of Scotland, from which he retired in 1881. Dr. Croll is chiefly known by his explanation of the astronomical causes of the Glacial Period (q.v.), which have been very generally accepted and which were expounded in his work *Climate and Time* (1875). In 1876 he was elected F.R.S., and was made LL.D. of the University of Glasgow. He died in 1890.

Croll, Oswald, born at Welter in Hesse about the middle of the sixteenth century, became physician to Prince Philip of Anhalt, and adopting the views of Paracelsus, wrote a work, *Basilica Chemica*, of some interest to the student of the history of science. He died in 1609.

Cromarty (Gael. *Crombathi*, Crooked Bay), a county and its capital in the N. of Scotland. The county was formerly split up into twenty detached portions, which were scattered about Ross-shire, and mostly incorporated in that county for administrative purposes. Originally the name applied only to the small tract on the S. shore of Cromarty Firth, but the Earl of Cromarty in 1685 and 1698 procured the annexation of all his outlying estates to this nucleus, and thus brought about the absurd geographical anomaly. This, however, was done away with in 1889, and the county is now united with Ross. The total area is about 345 square miles. Cromarty Firth, expanding into Cromarty Bay, affords one of the safest anchorages on the E. coast, and is protected by the mountain ranges known as the North and South Soutars. The municipal town of Cromarty stands at the entrance of the Firth, 19½ miles N.E. of Inverness. It combines, with Wick and other boroughs, to return one member to Parliament. The chief industry is fishing, but sail-cloth, cordage, and sacking are manufactured. Cromarty House occupies the site of the old castle of the Urquharts, and there is a good lighthouse. Hugh Miller, the geologist, was born here.

Crome, John, known as "Old Crome," to distinguish him from his son, was born at Norwich in 1769, being the son of a weaver. He was early apprenticed to a house-painter, and his natural fondness for art led him to give up his leisure to sketching and the study of nature. Friendly help enabled him presently to start as a drawing-master, and accident fixed his attention on the Dutch school of landscapists. Under the patronage of Sir William Beechey, he formed in 1805 the Norwich Society of Artists, in which Cotman, Vincent, Stark, Thistle, and Bernay Crome took a part. He rarely visited London, and, though he began in 1806 to exhibit at the Royal Academy, few of his works were seen there. His aim was the faithful reproduction of the scenery in which he lived, and he attained high excellence in dealing with trees and foliage. Among his best known pictures, none of which commanded a high price until after his death, may be mentioned *Mousehold Heath* (now in the National Gallery), *Oak at Poringland*, *The Willow*, *Coast Scene near Yarmouth*, *Bruges*, and *The Fishmarket at Boulogne*. He was successful also as an etcher, and his *Norfolk Picturesque Scenery*, posthumously published, possesses great merit. He died in 1821.

Cromer, a port and watering-place, on the N.E. coast of Norfolk, 20 miles N. of Norwich. The fine sands are attractive to bathers, and the pure, bracing air has in recent years brought many summer visitors in search of health. Owing to the encroachments of the sea the bay is dangerous for navigation, and the trade is small. Upon the cliff is a lighthouse 274 feet high. The Great Eastern Railway puts the town in easy communication with London, and it is rapidly growing in population and prosperity.

Cromlech. [Barrow.]

Crompton, Samuel, was born at Firwood, near Bolton-le-Moors, in 1753, and, as the son of a small farmer, was brought up to field labour. The loss of his father drove him to take work in a cotton mill, where his natural genius, aided by the elementary education he picked up in spare moments, enabled him to contrive improvements in machinery. Before 1780 he had invented the spinning mule, which revolutionised the manufacture of cotton goods and saved thousands to employers of labour. Want of means, however, compelled him to divulge his secret to persons who took advantage of him, and he scarcely reaped any benefit from his ingenuity. In his old age Parliament voted him £5,000, but this was lost in attempts to develop his business, and he died a poor man in 1827.

Cromwell, Oliver, the second son of Sir Henry Cromwell, of Hinchinbrook, was born at Huntingdon in 1599. He went from Huntingdon grammar school to Sidney Sussex College, Cambridge, and thence, on the death of his father in 1617, to study law in London. In 1620 he married, with an excellent reputation, Elizabeth, daughter of Sir James Bouchier, of Felsted, Essex, a lady of sweet and gentle disposition, who shared his troubled life and survived him fourteen years. Huntingdon sent him to Parliament in 1628, and his first recorded speech was a powerful attack on the "flat popery" of the High Church divines. The condemnation of his cousin, John Hampden, and the

interference of the Government in a work which he had at heart, viz. the completion of Bedford Level (1638), provoked him to head the opposition in his district. He became talked of as the Lord of the Fens, and in 1640 was elected to Parliament by the borough of Cambridge, his seat being retained by him a few months later on the summoning of "the Long Parliament." In 1642 hostilities broke out between the king and his people. The capture of Lowestoft, the protection of Gainsborough, and the rout of Henderson at Winceby gave him practical experience, and it was as a tried and trusted soldier that he led the left wing at Marston Moor on July 2nd, 1644. In the subsequent operations about Newbury he was hampered by the timidity of his colleague, the Earl of Manchester, whom he denounced to Parliament, with the result that "the Self-denying Ordinance" was passed, excluding all members of either House from military commands, Cromwell alone being exempted. Fairfax held the chief command, but all men looked to Cromwell as "the saviour of the nation," and after several minor successes over Rupert at Islip and Radcot Bridge, he was in June dispatched to assist Fairfax at Northampton with the rank of Lieut.-General. On the day after his arrival in camp the battle of Naseby (June 14th, 1645) decided the issue of the war, and the chief glory of that crushing victory rested with the "Ironsides" and their leader. The autumn was spent in bringing Bristol and the western counties into subjection, and at the meeting of Parliament in 1646 he was loaded with distinctions. Then followed the struggle between the Independents and the Presbyterians, representing respectively the military and the civil elements in the growing state. Cromwell's religious views and his sympathies with his trusted comrades led him to throw all his influence on their side, and in August, 1847, the army entered London in triumph. The futile negotiations with the king were now broken off by his flight from Hampton Court, and this resulted in a revival of Royalist activity, especially in Wales, where Cromwell was busily engaged in the early summer of 1648. But the most formidable movement was that in Scotland under the Duke of Hamilton, who, joined by Langdale in Yorkshire, was marching south with over 20,000 men. Cromwell hastened to the scene of danger, met the foe at Preston (August 17th), and after three days' fighting shattered the Duke's forces and took him prisoner. Following up his success with vigour, in less than two months he entered Edinburgh, received the adherence of the Scots, and was on his way home again. In the solemn proceedings of the High Court of Justice and the terrible event that resulted therefrom he bore a large share, his name standing third on the Royal death-warrant. The rising of the Levellers was next repressed by his heavy hand, and in August, with the title of Lord-Lieutenant, he left for Ireland to face the powerful organisation under Ormonde. Nine months of ruthless but judicious severity not only reduced the country to submission, but marvellously restored its material prosperity, and in May he was once more in London prepared to take command of the operations against the Scottish Covenanters with whom Charles II. had concluded a concordat. For some weeks he manœuvred against Leslie, till, obliged to fall back upon Dunbar, he was attacked in a disadvantageous position. But the courage and discipline of his veterans was not to be gainsaid, and between dawn and breakfast the Scots were routed like chaff before the wind. Remaining in Scotland during the winter, he passed with the summer into Fife and pushed on to Perth, which surrendered. Charles at this juncture played a bold stroke by advancing into England. Cromwell followed with all rapidity, gathering men as he went. He overtook the king at Worcester on September 3rd, 1651, and destroyed the last remnant of the Royalist army by "the crowning mercy" of that bloody day. The victor once more entered London in triumph, and was for a year engaged in consolidating the Commonwealth, passing the Act of Amnesty, reducing the army, and arranging for the dissolution of Parliament and the re-election. Hostilities by sea had broken out, too, with the Dutch, and were not brought to an end until Blake's great victory in February, 1653. Meanwhile, Parliament was showing some disinclination to decree its own "happy despatch," so on April 20th Cromwell marched into the House attended by a party of soldiers, and dissolved the assemblage abruptly. After more or less effectual attempts to tinker up the Constitution, Cromwell was appointed Lord Protector, empowered, with the assistance of a Council of State, to perform all the functions of Government until a Parliament should be duly elected. Parliament was, however, indisposed to accept the new Constitution without a struggle, the Republican members offering most strenuous opposition to the Protector's authority. After five months of wrangling, Cromwell dissolved it in January, 1655, and for nearly two years ruled absolutely. In 1656 the new Parliament assembled, and agreed, after some debate, on a constitution which embraced two Houses and a king, if Cromwell were willing to accept the title, but after weighing the advantages and disadvantages he refused this honour. More than one attempt on the Protector's life was detected during this period, and Lambert, his old lieutenant, fomented rebellion amongst the troops. A dissolution ensued early in 1567, and Cromwell resumed the heavy burden of despotism. He was cheered for the moment by seeing his alliance with France end in the humbling of Spain and the capture of Dunkirk, but a little later the fatal illness of his favourite daughter, Elizabeth Lady Claypole, shattered his already failing health, and he was brought from Hampton Court to Whitehall in a dying state. He expired on September 3rd, 1658. It may safely be said that in spiritual and moral qualities, in disinterested patriotism, and in capacity as a soldier and administrator, he compares very favourably with any monarch who has occupied the British throne.

Cromwell, RICHARD, the third son of the foregoing, was born at Huntingdon in 1626.

Along with his brothers Oliver and Henry, who died early, he was educated at Felsted, and was admitted at Lincoln's Inn in 1647. Soon afterwards he married and settled down at Hursley in easy-going obscurity. He appears to have taken no part in his father's struggles, but on the establishment of the Protectorate he entered Parliament and held several honorary positions. Proclaimed Lord Protector the day after his father's death, he duly opened Parliament in 1659, but had neither the capacity nor the desire to govern. Financial difficulties, both public and private, beset him. The Republicans clamoured for a dissolution, and the Royalists grew stronger day by day. In April Richard dismissed the House, and a few days later the remnants of the Long Parliament came together. To this body Richard resigned, and very soon afterwards left the country to avoid the pressure of creditors and the possible vengeance of the king's followers. He lived for twenty years in Paris or Geneva, and then, returning to England, settled at Cheshunt, where he died in 1712.

Cromwell, THOMAS, Earl of Essex, alleged to have been the son of a blacksmith, was born at Putney in 1490. His youth was spent abroad in commercial pursuits, and on his return he entered Wolsey's service, remaining faithful to him to the end, but having, according to some observers, a keen eye to his own interests. Before his protector's death he won the favour of the king by judiciously setting forth his plan for detaching the English Church from the control of the Papal See. Henry found him a zealous and unscrupulous agent in the promotion of the divorce and the suppression of the monasteries, and he heaped upon him offices and rewards, finally raising him to the peerage as Earl of Essex and giving him the Garter. During seven years his policy had a free hand, and his rapacity and tyranny were exercised without restraint. He tacitly encouraged Protestantism, not from any conviction, but to assist in breaking the tie with Rome, and for similar reasons, but partly also to strengthen his own position, he involved himself in negotiations with the German Courts and induced the king to marry Anne of Cleves. This piece of work proved his undoing. Hated alike by the people, the nobles, and the priests, he was denounced to Henry, who had by this time exhausted the need for his services, and was indignant at the matrimonial venture into which he had been entrapped. His fall was instantaneous. The Duke of Norfolk accused him of treason in the Council Chamber. He was hurried to the Tower, condemned by a bill of attainder, and beheaded on July 28, 1540.

Cronstadt, or KRONSTADT. 1. A fortified seaport of Russia at the S.E. extremity of the island of Kotlin, in the Gulf of Finland. Situated about twenty miles from St. Petersburg, it serves at once as the chief commercial harbour and naval arsenal of the capital, the island commanding all the sea approaches. The port is divided into the Merchant harbour, the Middle harbour, and the War harbour, the first two of which are divided by the Man-of-war's mole. Upwards of 1,000 trading vessels can be accommodated, and those drawing over 10 feet must unload. The harbours are connected by canals, and protected by six heavily-armed granite forts. A naval school has been established in the Menschikoff palace, and the town contains hospitals, cannon foundries, building-sheds, barracks, etc., besides the palace of Peter the Great. From November to April the port is closed by ice, but in the open season a large trade is done, the chief exports being tallow, corn, hemp, and flax. Cronstadt was founded by Peter the Great in 1710.

2. CRONSTADT, KRONSTADT, "KRUNEN A BRASSO," a town in Transylvania, Austria, on the river Farcas, seventy miles from Hermanstadt, is the capital of the district bearing the same name. Standing in a lofty valley on the flank of the eastern Carpathians, it nevertheless is surrounded by rich agricultural land, and is the most populous centre of the province. The old walled town dates from the 13th century. It contains a fine old Gothic Protestant church, a Catholic church, public library, Rathhaus, and other public buildings. The principal articles of trade are iron and copper, dyes, woollen and cotton goods, paper and printing, and bottles. It is connected by railway with Hungary.

Crookes, WILLIAM, F.R.S., born in London in 1832, became a pupil and subsequently assistant of Dr. Hofmann at the Royal College of Chemistry. In 1854 he was appointed superintendent of the Meteorological Department at the Radcliffe Observatory, Oxford, and in 1855 took the professorship of chemistry at the Chester training college. He founded the *Chemical News* and edited the *Quarterly Journal of Science.* In 1861, by means of spectrum analysis, he discovered the metal thallium, and in 1863 was elected F.R.S. In 1872 he began the researches which resulted in the invention of the radiometer, and two years later was rewarded by the Royal Society's gold medal. His investigations in molecular physics won him distinction from the French Académie des Sciences, and more recently he has, by means of the spectroscope, thrown considerable light on the constitution of the elements, his observations on radiant matter having gained the Davy medal in 1888. His contributions to the *Philosophical Transactions* and other scientific publications are numerous. For some time he devoted much attention to spiritualistic phenomena.

Crop, that part of the alimentary canal in birds, some insects, and worms, in which the food is stored up before its entry into the stomach.

Crops, ROTATION OF, a principle of agricultural practice depending on the fact that the growth of one kind of plants, year after year, and the removal either of the entire produce or of the ripened fruit, rapidly impairs the general fertility of the soil. It is necessary, therefore, so to alternate different crops as to give the land an opportunity of acquiring fresh available supplies of those of its chemical constituents which have been removed in any crop before growing that crop upon

it a second time. This replacement of waste may be effected by manuring, or by ploughing or digging in certain things, such as stubble or haulm, or by fallowing; but is most economically effected by rotation of crops. Whilst land is lying fallow, *i.e.* without a crop, or is under some other crop, rain, frost, sun, wind, dust, and worms either bring new matter to it, or loosen, pulverise, dissolve, or otherwise change substances in it, so as to render them available for the plant. It is usual to alternate grain crops and green crops, and, though the special circumstance of each soil and farm must be considered, what is known as the four-field or Norfolk system is generally adopted, by which turnips are followed by barley, barley half by clover and half by beans, peas, potatoes or vetches, and these by wheat or oats. Italian rye-grass may be substituted for clover, and at the next rotation the clover is sown on the half on which it was not before, so that clover comes only once in eight years on the same land. Similarly turnips may be replaced by mangel, carrots, cabbages, or swedes.

Croquet, connected with the idea of *hook*, though it is doubtful whether this idea has reference to the mallet or to the hoops through which the ball is driven, is a game which was much in vogue a few years ago, but in England, at least, has almost disappeared before the game of lawn-tennis, which is better suited to modern ideas of female physical education. The game is played by two or more persons, generally arranged in equal parties, whose object it is to drive each one a wooden ball from a starting peg through a series of iron hoops of varying position and arrangement to another peg, and then back through some of the same and other hoops to the starting-peg, the first party winning whose balls all strike the starting-peg on the backward journey. The players take their turns in the order of certain coloured rings painted upon the pegs, each ring corresponding in colour with one of the balls. A player on passing through a hoop has a further turn, so, too, upon striking another ball, which he is allowed to further drive away by a blow upon his own ball placed in contact with that which he has struck. hindering it if it be an adversary's, helping it on if it is a friend's. After passing the last hoop on the home journey a player becomes a "rover," and may roam over the ground aiding his friends and damaging the foe, whose object it becomes to drive a rover, if not the last of the side, against the peg and so end his roving life. The decay of croquet is to be regretted, for it combined gentle exercise with an abundance of fresh air, and so provided amusement for many who would find lawn-tennis too violent an exercise. and it also gave opportunity during the interval between turns for many an interesting conversation.

Crosier (written also CROZIER), a staff carried before bishops and other great ecclesiastical dignitaries, the same as the pastoral staff. It is topped by a more or less ornamented crook to indicate the bishop's pastoral authority over his flock. The cross upon the patriarch's crosier has two transverse bars, that upon the pope's crosier has three such bars.

Cross, generally consisting of a vertical limb crossed by a horizontal one, was an instrument of punishment formerly used as a means of inflicting what was an undignified and degrading death. By its employment as the Saviour's death-instrument it was elevated into a position of respect and regard among most Christian bodies. Other races than Christian have attached a symbolism to the Cross, and have respected it. The most usual forms of cross are (1) the Latin Cross, in which the cross-bar is near the top of the upright; (2) the Greek Cross (called also St. George's), in which the limbs cross at the centre and are of equal length; (3) St. Anthony's Cross, which resembles the Greek letter T; (4) St. Andrew's Cross, shaped thus X; (5) the Maltese or eight-pointed cross; but there are many other varieties, both in ecclesiastical and heraldic and ornamental use. (*See* Plate, page 65.) The many market-crosses, preaching-crosses, and monumental-crosses scattered about the world have in some countries suffered much through sectarian zeal. The crosses in memory of good Queen Eleanor plead for preservation to the sentimental side of human nature, and have met with some consideration. The Fiery Cross of the Scottish Highlands has been made familiar to us by Scott, astronomy has its Southern Cross, and orders of knighthood have their Grand Cross. The Invention of the Cross, *i.e.* its discovery in 326 A.D. by St. Helena, is commemorated on the 3rd of May. The word is also used metaphorically to denote trial or trouble. As a verb, the word signifies ecclesiastically to sign with the sign of the cross. Alice Brand in the ballad crossed the dwarf Urgan once, twice, and thrice before he resumed his original shape as her brother.

Crossbill, any species of the Passerine genus Loxia, in which the lower mandible curves upwards to the right or left of the upper mandible. Buffon described this formation as an "error of nature": it is an excellent adaptation of means to an end—to enable these birds to break up the fruits of conifers to obtain the seeds, on which they feed, and it is also used as a climbing organ. The Common Crossbill (*Loxia curvirostris*) is from six inches to seven inches long; the young males are greenish-brown, with an olive tinge, and speckled with dark brown; after the first month a red tinge is acquired, and after the second the plumage becomes olive brown, washed with greenish-yellow on the back. It is a somewhat irregular British visitant, frequently staying to breed. *L. pityopsittacus* (the Parrot Crossbill) and *L. bifasciata* (the Two-barred Crossbill) more rarely occur. All the Crossbills are gregarious, and frequent pine-forests in the northern hemisphere.

Cross Bow was a bow fixed upon a stock, and the string in its rebound struck a small bolt, arrow, or quarrel, a trigger holding the bow at its required tension till the moment of discharge. The bolt sometimes passed along a groove, sometimes along a barrel. The cross-bow was a formidable weapon of mediæval warfare, and was sometimes of such strength that mechanical contrivances were required to bend it. Pollaiuolo's picture in the National Gallery of the

Crosses

Village Cross of Lymm Cheshire

Celtic Cross

A wayside Cross of Normandy

Cornish Cross

The Market Cross at Salisbury '92

An English Churchyard Cross

Incised Greek cross

Altar Cross

Incised Latin cross

Heraldic

Gloucester Cath.l

Crosses

Charing Cross Memorial of Queen Eleanor (restored)

BURKE DOWNING '92

Martyrdom of St. Sebastian presents some striking examples of handling the cross-bow. The *arbalest* or *arbalète* was a favourite weapon of the Low Countries, and its memory is kept green by the Jardin des Arbaletriers at Antwerp, while in the neighbourhood of that town the weapon is still used in competitions, and examples of it may be seen in which a small steel bow is fitted to a polished stock closely resembling that of a gun or rifle.

Cross Buns are buns marked with a cross, and largely eaten in England upon Good Friday. The custom of marking certain days by certain kinds of food was once widely prevalent and is still alive; for instance, furmety at Christmas, spiced ale on Mothering Sunday, simnel cake and custards, called pudding-pies in some parts, each at its special time.

Crosse, Andrew, was born near Taunton in 1784, and inherited a considerable landed estate. He devoted himself to the study of the formation of crystals under voltaic electricity, and gave the results of his labour to the British Association in 1836. He is said to have early predicted the invention of the electric telegraph. His alleged production of acari by the electric current led to a long and acrimonious discussion, and brought him into scientific disrepute. He died in 1855.

Crossley, James, F.S.A., was born at Halifax, Yorkshire, in 1800; and educated for the law, which he practised until 1860. He contributed articles on antiquarian and literary subjects to *Blackwood*, *The Retrospective Review*, and *The Quarterly*, and was a friend of Charles Lamb. Various societies, such as the Philobiblon, the Chetham, and the Spenser, owed much to his exertions. He collected a large and curious library. His death occurred in 1883.

Cross-pollination. [Pollination.]

Crotalidæ. [Rattlesnake.]

Crotch, William, Mus. Doc., was born at Norwich in 1775, and showed a talent for music almost in his infancy. In 1797 he was appointed professor of music at Oxford, and in 1822 became principal of the Royal Academy of Music. He was a voluminous composer for the organ and pianoforte, and wrote a treatise entitled *Styles of Music of All Ages*. Two of his best-known works were *Palestine*, an opera, and an ode, *Mona on Snowdon Calls*. He died at Taunton in 1847.

Crotona, or Croton (mod. *Cotrone*), a city of Magna Græcia, founded by Achæans in 710 B.C., at the mouth of the river Æsarus on the E. coast of Italy. Hercules being its tutelary god, Crotona cultivated athleticism, whilst the neighbouring city of Sybaris was sunk in luxurious sloth. Under the leadership of the famous Milo, the inhabitants attacked and utterly destroyed Sybaris (510 B.C.). After this the followers of Pythagoras obtained such a predominance in the existing oligarchy that a revolution ensued, and a democracy was established. A medical school, of which Alcmæon was the chief ornament, grew up here at an early period. Though defeated by the Locrians and Rhegians, the Crotoniates maintained their independence, and remained neutral during the Athenian invasion of Sicily. Though occasionally subject to Syracuse, the city on the whole maintained its autonomy against aggressors until the second Punic war, when the shelter it afforded to Hannibal led to its ruin. The Byzantine emperors held it until it passed into the hands of the Normans. The famous temple of Lacinian Juno containing the *Helen* of Zeuxis was in its vicinity. The modern town is about a mile from the old site.

Croton Oil is expressed from the seeds of *Croton Tiglium*, a small euphorbiaceous tree native to the Malabar coast, in which it occurs to the extent of 50 to 60 per cent. The tree has scattered oval-oblong acuminate leaves and greenish monœcious flowers, the male having five petals and ten to fifteen stamens, whilst the female are apetalous and three-styled. The three carpels each contain one seed about half-an-inch long, $\frac{2}{5}$ inch broad, of a cinnamon brown colour. The oil is transparent, viscid, pale yellow or brownish, acrid, fetid, and acid, soluble in ether, and slightly so in alcohol. It contains acetic, butyric, valeric and tiglic acids. The oil prepared in England is preferred, and the seeds are imported from Bombay and Cochin. The oil is adulterated with olive, castor, and nut oil. *Croton Eleutheria* yields Cascarilla bark, and *C. pseudo-China*, the Mexican Copalche bark. The plants known as *C. pictum*, *C. variegatum*, etc., cultivated for their foliage, which is crisped and mottled with red, orange or yellow, belong truly to *Codiæum pictum*, a species of a genus differing from *Croton* in the indefinite number of its stamens. Croton oil acts as a powerful irritant to the skin. It used to be not infrequently employed in the form of linimentum crotonis to inflamed joints. Its use is now practically superseded by other forms of counter-irritants. Administered internally, croton oil is a very powerful purgative, which should never be given, save under professional advice.

Crotophaga, a genus of American cuckoos, with three species, ranging from Brazil to the Antilles and Pennsylvania. They are social in habit, and one nest is said to serve many pairs. They feed on the larvæ of insects that infest cattle. The best known species is *C. ani*, the Savannah Blackbird (q.v.).

Croup, a term derived from an Anglo-Saxon word, signifying *to cry out*. The word croup was apparently employed for many centuries in Scotland to a certain kind of cough associated with disease of the larynx in children. Thus, the term croup originally referred to a symptom of disease. About the middle of the last century an attempt was made to associate the word not with a symptom, but with an actual form of disease. The croupy cough was found in some instances to be caused by the presence of membranous exudation in the larynx, and it was considered desirable to designate such a condition of things by a specific term, viz. croup. Meanwhile the pathology of diphtheria was worked out by a French physician, Bretonneau, and

it became obvious that many cases of membranous laryngitis were of diphtheritic origin. The question arose—were the terms diphtheritic laryngitis as employed by Bretonneau, and croup as understood by the Scottish physicians, co-extensive, or were they to be considered as descriptive of entirely distinct forms of disease? For many years it was the fashion to distinguish between croupous and diphtheritic inflammation, and much controversy and much confusion resulted. The question cannot yet be held to be finally settled, but the tendency at present seems to be to restore to the term croup its original signification, and to consider it to denote a set of symptoms and not a species of disease. The character of the croupy cough can only be grasped by actual experience; no amount of description will do justice to it. Mothers are apt to apply the term croupy in a very indiscriminate manner. True croup is a symptom of grave significance; it is only produced by involvement of the larynx; and laryngeal disease in young children is no trifling matter. Croup particularly affects children between two and five years of age; it is said to occur with special frequency in cold and damp situations; it not unfrequently accompanies the onset of measles, and certainly in many instances it is caused by the specific poison of diphtheria. Unfortunately in many patients the history is one of rapid progress from bad to worse, of increasing difficulty in breathing, and finally of death by suffocation. Hence the advisability of procuring professional advice from the outset. In some of the gravest cases *tracheotomy* (q.v.) has proved the means of saving the patient's life. Spasmodic croup, false croup, or *laryngismus stridulus*, is a distinct affection met with in young babies from six months to two years old. The subjects of this disease are almost always boys, and they usually present symptoms of rickets. The seizures only last a few seconds, but they are apt to recur, and may prove fatal. *Laryngismus stridulus* is allied to epilepsy, and is usually associated with carpo-pedal contractions.

Crow, a book-name for the genus Corvus, with over fifty species, the type of the Passerine family Corvidæ, universally distributed, except in South America and New Zealand, and reaching to the extreme north of Europe and Asia. The beak is hard, stout, compressed, and sharp at the edges; nostrils at its base, and generally hidden by stiff feathers directed forwards; wings long and graduated; tail more or less graduated; feet and claws strong, the latter curved and sharp. Four, or according to some authorities, five species are British. Three of these—the Raven (*C. corax*), the Rook (*C. frugilegus*), and the Jackdaw (*C. monedula*) are treated separately. The Black or Carrion Crow (*C. corone*) is from eighteen to twenty inches long, and has the whole plumage black, glossed above with metallic reflections, varying from violet to green, according to the light. In the Grey, Hooded, or Royston Crow (to which specific rank, as *C. cornix*, is sometimes given), about the same size as the Black Crow, the nape, back, rump, and most of the under surface are smoky grey. The bill, legs, and toes, are black in both. Professor Newton, after carefully examining the evidence for both views, has come to the conclusion "that no specific distinction can be maintained" between these two forms. The chief arguments in favour of this conclusion are the interbreeding of the two forms, and the frequent occurrence of black and grey birds in the same nest. The principal food of these birds is carrion, but nothing of an animal nature comes amiss to them, from a dead sheep to insect larvæ. Macgillivray notes that they sometimes feed on crustaceans, molluscs, and worms, and occasionally on grain. They are the natural enemies of game-keepers, for they devour game eggs, young birds, and leverets, and, as a consequence, are shot and trapped without mercy. It should, however, be remembered in their favour that they destroy large numbers of mice and insects. *C. americanus*, the American Crow, is a smaller form, and feeds largely on grain. *C. ossifragus*, the Fish Crow, also American, is a coast bird. *C. splendens*, the Indian grey-necked Crow, though useful as a scavenger, is as mischievous and thievish as a magpie. *C. capellana*, from the Persian Gulf, is closely allied to the Hooded Crow. [Chough, Jay, Magpie.]

Crowe, Eyre Evans, born at Redbridge, Hants, in 1799, and educated at Trinity College, Dublin, adopted the profession of literature, and wrote for the *Morning Chronicle*, *Examiner*, *Blackwood*, and *Lardner's Encyclopædia*, later on becoming editor of the *Daily News*. Foreign politics and history were his strong points. Besides many ephemeral productions he published *Lives of Foreign Statesmen*, *The Greek and the Turk*, *The Reigns of Louis XVIII. and Charles X.*, and a *History of France*, the last being ranked as a standard work. He died in 1868. His son, Sir J. A. Crowe, C.B., K.C.M.G., is a distinguished authority on Italian art and commercial treaties.

Crowfoot, the popular name, derived from the deeply-divided leaves, of many species of *Ranunculus* (q.v.). As our terrestrial, yellow-flowered forms are now generally known as buttercups (q.v.), the name crowfoot is especially retained for the white-flowered aquatic species, the sub-genus *Batrachium*, or water-crowfoots. These commonly have leaves either broad, slightly lobed, and floating, or much divided into linear segments and submerged, in neither case resembling "crow-toes," as Shakspeare has it.

Crowland, or Croyland, an ancient town at the confluence of the river Welland and Catwater Drain in Lincolnshire, 8 miles from Peterborough. The bridge connecting the principal streets is one of the most remarkable specimens of Saxon architecture. A famous abbey was founded here in 714 on the site of an earlier hermitage. It was twice burnt by the Danes and twice restored, the ruins existing at the present day. The historian Ingulphus was one of its abbots.

Crown (Lat. *corona*) is a root existing in many languages, and signified at first an ornament for the head, such as the poet's "coronals." It was

then adopted as a mark of special honour, as the civic and mural crowns of the Romans, and the victor's laurel of the Greeks. Finally, it became one of the special symbols of sovereignty, and heraldry introduced a certain uniformity in its shape, so that its form might show the rank of the wearer. The crown of Queen Victoria is elaborate and highly ornamental; the crowns of Austria, France, and Russia have their distinctive features—that of Austria much resembling a mitre. The word is also much used metaphorically and technically, the martyr's crown, a sorrow's crown of sorrows, the crown of an arch, of the head, of a tooth.

Crown, Clerk of the, the principal official of the Crown Office in Chancery (now the Chancery Division of the High Court of Justice). He is an officer of Parliament and of the Lord Chancellor in his non-judicial capacity, rather than an officer of the Courts of Law. He makes out and issues summonses for the election of members to both Houses of Parliament; he has the custody of the poll-books and ballot-papers; and upon the meeting of a new Parliament he delivers to the Clerk of the House of Commons a list of the names of members returned to serve in that Parliament, after which the Commons go up to the House of Lords, and the Lord Chancellor addresses them generally upon the object and purpose of their being summoned to Parliament. The Clerk of the Crown also reads the titles of bills at the time the Royal assent is signified to them by commission. Nearly all patents passing the Great Seal, except those for inventions, are made out in his office, and he makes out the warrants for almost all letters-patent under the Great Seal. He also performs the duties formerly attached to the Clerkship of the Hanaper. He is Registrar of the Lord High Steward's Court. [Patent.]

Crown Imperial (*Fritillaria imperialis*), a stately, old-fashioned garden-flower. It is a perennial bulbous plant belonging to the lily tribe, with numerous rather narrow leaves on its erect aërial stem, which is crowned by a tuft of leaves from beneath which hang the conspicuous tulip-like flowers. The six free perianth-leaves are a brownish red or a clear yellow, and each has a large white nectariferous gland at its base.

Crown-piece, in England a silver piece of the value of 5s.—lately almost fallen into disuse, but now revived again. Originally it gained its name from having a crowned head upon the obverse, but at present this is no peculiarity. Formerly there were also gold crown-pieces. The coin was introduced by Edward III., Edward VI., James I.; and Charles I. used the figure of the sovereign on horseback, but from Charles II. to Victoria the head of the sovereign formed the obverse, while now and latterly the reverse bears a representation of St. George slaying the Dragon.

Crowned Crane, any bird of the genus Balearica, of the family Gruidæ. [Crane.] The bill is much shorter than in the true Cranes, and there is a crest of unwebbed shafts radiating from the top of the head. *B. pavonina* is the West African Crowned Crane, and *B. chrysopelargus* the Kaffir Crane.

Crows, properly *Upsarokas*, prairie Indians, usually grouped with the Dacotahs, forming with the Minnetarees the Upper Missouri division; but by some authorities regarded as an aberrant branch of the Shoshone (Snake) family. Formerly roamed the Yellowstone Valley and the region thence westwards to the Rocky Mountains; three divisions, Kikastas, Ahnahaways, and Allakaweahs.

Crowther, The Right Reverend Samuel Adjai, D.D., Bishop of the Niger Territory, a native of Africa, was born at Ochugu, in the Yoruba country about 1810. In 1821 he was captured by slave dealers, and shipped for a foreign mart, but an English cruiser restored him to liberty, landing him at Sierra Leone. Here he was baptised in 1825, and named after the then Vicar of Christ Church, Newgate Street. After receiving a fair education, he acted for several years as a teacher, and in 1841 joined the first Niger expedition. In 1842 he came to London, was trained at the Missionary College, Islington, and ordained in 1843. For twenty years he laboured assiduously in Africa, taking part in the Niger expedition of 1854, and writing an excellent account of its progress. He also translated the Bible into the Yoruba dialect, and wrote many works for the enlightenment of his heathen compatriots, besides making several interesting contributions to geographical science. In 1864 he was appointed the first Bishop of the Niger Territory, and until his death in December, 1891, discharged the duties of his post in such a way as to merit the highest approbation. He was a vigorous, kind-hearted, intelligent man.

Croydon, a town in Surrey on the river Wandle, 9 miles from London. The Roman Noviomagus was in its immediate vicinity, and the name Croindone occurs in Domesday Book. Many Roman relics have been found here, and there are traces of a British camp near Addington Park. Lanfranc held the manor of Croydon, and built an archiepiscopal palace, which was kept up until 1750. Parts of the building still remain. The streets are well laid out, and many handsome villas have sprung up in the district owing to railway facilities, there being seven stations. There is a handsome modern church and the usual public edifices. The Surrey summer assizes are held at Croydon alternately with Guildford.

Crucibles are vessels employed for exposing substances to high temperature, either for purposes of fusion, or to induce some chemical or physical change. They should, therefore, be capable of withstanding great heat and changes of temperature, and should also be unacted upon by the fuel, or the substances heated. *Clay* crucibles are made of very refractory fire-clays, or mixtures of clay and sand, and various sands, as Hessian, Cornish, London, Stourbridge, etc., are used in assaying and metallurgy. *Porcelain* and *platinum* crucibles are indispensable to the chemist in quantitative analysis. Silver, nickel, iron, plumbago, and lime

crucibles are also each used in special operations for which the other materials would be unsuitable.

Cruciferæ, a large family of thalamifloral dicotyledonous plants, mostly herbs with watery juice which is often pungent or even acrid, though never poisonous. They have generally simple, scattered, exstipulate leaves, and yellow, white, or rarely red flowers arranged in ebracteate and often corymbose racemes. There are two pairs of sepals to each flower, the outer pair antero-posterior, the inner ones often pouched at the base. The four diagonally-arranged hypogynous petals being arranged like a cross, give its name to the order, which, however, corresponds almost exactly with Linnæus's fifteenth class, the *Tetradynamia*, so called on account of the stamens being tetradynamous—six in number, that is, the two outer or lateral ones shorter, the four inner ones being longer. These four long stamens apparently represent two antero-posterior stamens, which at an early stage undergo branching or collateral chorisis (q.v.). There are two carpels, which are united into a dry pod-like fruit known as a *siliqua* (q.v.). It is two-chambered, owing to the formation of a septum by the ingrowth of the carpels from their parietal placentas. The fruit is often compressed, either in the direction of this septum or at right angles to it, and is sometimes shortened, when it is termed a *silicle*. The seeds are generally small, and are exalbuminous, the order being divided into tribes in accordance with the various ways in which the cotyledons (q.v.) are folded with reference to the radicle. The order includes the genus *Brassica* (q.v.), the cabbages and mustards, sea-kale, cresses (q.v.), radishes, stocks, wallflowers, rockets, and woad. Many plants belonging to it have oily seeds, as the rape and the mustard, for example.

Crucifix (Lat. *crucifigere*), a cross bearing the figure of Christ crucified. Its use appears to have been introduced about the 9th century, and no instance of it has been found in the catacombs, nor is it alluded to by any writer of the first four centuries. The crucifix is in use in most Christian churches, though many of the Reformers and their followers have abandoned its use except in sculpture. Some crucifixes had a figure clothed and with eyes open as alive, but in most cases the body, clothed only with a girdle about the loins, has the appearance of death. The figure on the Jansenist crucifix has the arms hanging down instead of extended upon the transverse limbs of the cross.

Cruden, Alexander, born at Aberdeen in 1701, and educated for the Church at Marischal College, became insane owing to a disappointment in love. Coming to London he started as a bookseller in 1732 near the Royal Exchange, and in 1737 produced his *Concordance* to the Bible, which was dedicated to Queen Caroline. He was several times confined as a lunatic, and conceiving himself to be divinely commissioned to reform moral abuses, he assumed the title of "Alexander the Corrector," under which disguise he wrote some curious memoirs. He died in 1770.

Cruikshank, George, the son of an artist, was born in London in 1792, and began before manhood to draw and etch illustrations for children's books. In association with William Hone he produced a long series of political and social caricatures, marked by a certain sense of humour and much grotesque power. He illustrated Fielding, Smollett, Scott, Harrison Ainsworth, and many other authors, besides contributing thousands of drawings to current periodicals. The most characteristic specimens of his style are to be found in the original editions of Dickens's *Oliver Twist*, *Nicholas Nickleby*, and *Sketches by Boz*. Later in life he devoted his genius to the cause of temperance, and brought out the plates so well known as *The Bottle*, painting also in oils *The Worship of Bacchus*, which he presented to the nation. His personal character was almost as eccentric and as vigorous as his artistic creations. He died in 1878, and was buried in St. Paul's Cathedral.

Crusades, wars, sometimes degenerating into mere marauding expeditions, undertaken in the Middle Ages at different periods for rescuing the Holy Land and its sacred places from heathen hands. The first, in consequence of Peter the Hermit's preaching, was headed by Godfrey de Bouillon in 1096; the second was preached by St. Bernard in 1147; the third, in 1189, had among its members Richard of England, Philip Augustus of France, and Leopold of Austria; the fourth, in 1202, led to the founding of a Latin empire in the East by Baldwin of Flanders; the fifth, in 1228, was commanded by Frederick II.; and the sixth and seventh, in 1248 and 1270, were under St. Louis IX. of France. However they may be condemned, the crusades led to trade and intercourse between East and West, and those who took part in them at least pursued a lofty ideal. The word is also used metaphorically of an attack upon an abuse.

Crustacea, the largest class of the phylum Articulata, including the Crabs, Lobsters, Shrimps, Barnacles, Water Fleas, Sand Hoppers, etc. They are mostly aquatic, and breathe by gills or the general surface of the body. They have two pairs of antennæ or feelers, both of which obtain their nerves from the mass above the œsophagus known as the brain (a "syncerebrum"). The thorax (the middle division of the body) is more or less united to the head, and carries a series of jointed limbs; the abdomen is usually also segmented and limb-bearing. The external form varies greatly; segmentation is usually well marked, but in one or two groups, such as the Ostracods, it is never seen, and in others it is rudimentary. Most Crustacea are, however, composed of a series of more or less similar segments; they are typically cylindrical or depressed rings bearing at the lower margins a pair of jointed appendages. The number of segments varies greatly; in the higher orders, such as the Decapods, the number is fixed at twenty (five in the head, eight in the thorax, and seven in the abdomen) as in Crayfish (q.v.); in these the appendages are altered into feelers, jaws, claws, walking limbs, accessory sexual organs, and swimming structures. In other orders the number of segments may be

much greater; thus, it is over sixty in Apus, a form common in fresh water in Northern Europe. Externally the Crustacea are nearly always protected by a hard outer crust, which is usually periodically thrown off (ecdysis). The appendages are always jointed and consist of a basal joint (or propodite) and two branches, the exo- and endopodites; in the first antenna and in the Ostracods there is typically only one branch. In *Apus* there is more than one pair of appendages on each of the hinder segments of the thorax. Respiration is mostly by branchiæ or gills, but it is cutaneous or effected by the general surface of the body in the Copepods and Barnacles; it is also rectal in the Phyllopods, Cladoceræ, Crayfish, etc., water being periodically admitted to and forced from the anus. The body cavity (q.v.) usually is of the type known as a "pseudocœle" or false cœlome, but in the Prawns there is a large true cœlome or "archicœle" (q.v.). The eyes are simple or compound; there is usually one pair but may be more, or there may be one unpaired median eye. In some of the deep sea Crustacea, such as the Euphasidæ, there are also scattered structures which are either eyes or luminous organs at the bases of the gills and limbs. There are many cases of degeneration in the Crustacea; thus the subterranean forms have lost their eyes. Parasites, *e.g.* the *Rhizocephala*, have lost the mouth and digestive apparatus; the most striking case is that of the complemental males of the Cirripedia, small dwarf forms, which live only to fertilise the female. Development is very seldom direct, and there is usually a well-marked metamorphosis; most of the Entomostraca are hatched into the Nauplius (q.v.) form; most of the Decapods commence life as Zoœa (q.v.), but a few, such as *Penæus* and *Euphasia*, have a Nauplius stage. The Crustacea are divided into two subclasses—the Entomostraca (q.v.) and the Malacostraca (q.v.); the former are all small simple forms, with a variable number of segments. This includes four orders—the Phyllopoda (q.v.), *e.g.* the Fairy Shrimp, the Water Fleas, etc.; the Ostracoda (q.v.), including the Cyprids; the Copepoda (q.v.), *e.g.* Cyclops; and the Cirripedia (q.v.), *e.g.* the Acorn Shells and Barnacles. The Malacostraca have nineteen or twenty segments and are larger. This includes three groups—(1) the Leptostraca (q.v.), with the interesting genus Nebalia; (2) Arthrostraca (q.v.), including the Amphipoda (q.v.) (sand shrimps, etc.), and Isopoda (q.v.), *e.g.* the "Water Slaters"; and (3) Thoracostraca — this is divided into the Sessile-Eyed Crustacea (Edriophthalmata), including the Cumacea and Stomatopoda (q.v.), *e.g.* Squilla, and the Stalked-Eyed Crustacea (Podophthalmata), including the Schizopoda (q.v.) as Mysis, and the Decapoda (q.v.), *e.g.* Crabs, Lobsters, Prawns, etc. The Crustacea are world-wide in distribution, but are mainly marine; the Branchiopoda (q.v.) live exclusively in fresh water or salt lakes and marshes; some Amphipoda, Isopoda, and Decapoda are terrestrial. The Phyllopods commence in the Cambrian period, the Decapods in the Carboniferous, and the Cirripedia and Ostracoda in the Silurian. The Trilobites are now generally referred to the Arachnida.

Crutched Friars, an order of Friars who gained this name in England from the cross which they wore upon their dress. They seem to have appeared in England in the 13th century, and had houses in London (where the name still survives), in Oxford, and in Reigate.

Cryolite, a white or brownish translucent mineral, which is found in Greenland. It consists of the double fluorides of sodium and aluminium (Na_3AlF_6). It has a specific gravity of about 3, and is very easily fusible. It is largely employed in the manufacture of soda, alum, and aluminium, and of a white porcelain-like glass.

Cryophorus (Gk. *kruos*, cold; *phorein*, to carry), in practical physics, is a glass tube with a bulb blown at each end, containing a small amount of water, the rest of the space being occupied by water vapour alone. If the water be confined to one bulb and the other be placed in a freezing mixture, the water vapour is condensed; evaporation takes place at the surface of the liquid; heat is by this process abstracted from the liquid, which may thus be made to freeze without actual contact with the freezing machine. [Evaporation.]

Crypt (Gk. *kruptein*, to hide) originally denoted a den or other secret place. The name then came to be applied, especially in an ecclesiastical sense, to the vaulted part beneath a church or cathedral, especially below the choir, where sometimes the body or relics of a saint were preserved, a custom which seems to have arisen from the practice of building churches above the graves of martyrs and saints. The crypt beneath Canterbury Cathedral is famous and extensive, and that beneath St. Paul's Cathedral is well known. There is a notable crypt beneath the choir of St. Hubert's Abbey at the town of that name in Belgium. The name is also used in anatomy.

Cryptogamia, the name of the twenty-fourth class of the Linnæan classification of plants, implying that in them the process of fertilisation is obscure, is still generally and conveniently employed as a collective name for the three lower sub-kingdoms of the plant world, the Thallophyta, Bryophyta, and Pteridophyta. These plants differ much among themselves in essentials of structure, especially in their vegetative organs, and it is difficult to state positive characters in which they agree. Thus the Thallophytes (algæ and fungi) are entirely composed of cellular tissue, generally consist of a *thallus*, without distinction of stem and leaf, and in many cases possess no process of sexual reproduction. In Bryophytes (mosses and liverworts) and Pteridophytes (ferns, horse-tails, and club-mosses) there is a great contrast in the character of the alternation of generations (q.v.), but there is generally a distinction of stem and leaf, and the two groups agree with one another, and with some of the higher Thallophytes, in having a motile antherozoid (q.v.) as the male element in a sexual process, and in the formation in most cases of minute separable asexual reproductive bodies known as *spores* or *gonidia*. From higher plants Cryptogamia are

popularly separated as "Flowerless plants," having as a rule no conspicuous clusters of specially modified leaves (perianth) surrounding their spore-bearing leaves or sporophylls, whilst these last but slightly resemble the stamens and carpels of the group called in contradistinction Phanerogamia (q.v.) or Flowering plants. More real distinctions consist in the absence of motile antherozoids in these latter plants and in the formation of that complex reproductive body, the seed, from producing which phanerogams are now termed "spermaphytes." As distinguished from the Thallophytes or *Thallogens*, Bryophytes and Pteridophytes are sometimes termed *Acrogens*, having stems growing mainly at their apex, whilst Phanerogams were formerly divided into *Endogens* and *Exogens* (q.v.). Again, as distinguished from Dicotyledones and Monocotyledones, Cryptogams were once termed *Acotyledones*, an inaccurate term, since, though not forming any true homologue of a separable seed with its various coats, the higher Cryptogams do form an embryo with cotyledons, radicle and plumule. Though abandoned by the philosophical student of plant structure, the term Cryptogamia is likely to be long retained in general use, even among botanists, as a convenient term for these three lower sub-kingdoms. Here, however, it is far easier to describe the characteristics of these groups under their separate headings than to state characters common to them all.

Cryptogamic Plants. [Cryptogamia.]

Cryptography, as the name denotes, signifies *secret writing*. At all times since the introduction of writing there have been occasions when men, for one reason or another, have desired to make communications which should be unintelligible if they fell into hostile or curious hands. The Spartan ephors wound a piece of paper, or its equivalent, spirally round a staff and wrote along the line of the staff. When unrolled this strip carried no connected intelligence, but became legible when rolled round a similar stick in the possession of the recipient. Bacon set great store by cipher, and Charles I. and his queen largely employed it in their correspondence. Pepys's diary is in cipher. Many ingenious systems of cipher have been invented, from the simple substitution of one letter of the alphabet for another, well known to every schoolboy, to the employment of an elaborately changing series of symbols, which present greater difficulties, but not insuperable ones, to a would-be decipherer, provided the writing is of some length. Many people use a secret writing of their own in making entries in their diary. If the same symbol always represents the same letter, deciphering is comparatively easy. How to set about reading a cipher is interestingly set forth in Edgar Allan Poe's tale, *The Gold Beetle*. A cipher which presents much difficulty is that where two persons who have each a copy of a certain edition of a book, refer to such a number of letters on such a line, on such a page; but the writing and reading are both tedious processes. The modern telegraph codes used by commercial houses are the most usual kind of secret-writing to be met with nowadays.

Cryptomeria, a genus of *Coniferæ*, belonging to the sub-order *Taxodineæ*, and native to Japan. Its leaves are short, linear, and rigid, crowded and spreading. The flowers are monœcious, the male ones having peltate stamens each with five pollen-sacs at its base, and the small globular female cones having four to six winged seeds in the axil of each scale. *Cryptomeria* is hardy and often reaches a large size in English pinetums.

Cryptozonata, that order of Starfishes which includes all those in which the marginal plates are small and inconspicuous, as in the "Common Sand Star" (*Asterias*). In the other order the marginal ossicles are large, as in *Astropecten*, and it is therefore known as Phanerozonata. The principal forms included in the Cryptozonata are the "Common Sand Stars" (*Asterias*) (q.v.), Brisinga and its allies, the Linckias and the "Sun Stars" (*Solasteridæ*).

Crystal (from the Greek *krustallŏs*, clear ice) was the term originally applied to the clear, colourless form of quartz (q.v.), still known as rock-crystal, which occurs in six-sided prisms with six-sided terminal pyramids, and which, until the seventeenth century, was supposed to be the result of extreme cold acting upon water or some other substance. The term was afterwards extended to other bodies, some colourless, others coloured but still translucent, and others even opaque or metallic, until it came to indicate the definite geometrical form, and not the ice-like transparency.

Nicholas Steno, a Dane, recognised in 1669 that the angles of inclination of the faces of rock-crystal were constant, though the faces themselves varied in shape and size. Bartholinus, Huyghens, and Newton studied the property of double refraction (q.v.) exhibited by Iceland spar, the clear form of calcite (q.v.), and, to a less extent, by quartz; and Robert Boyle (1672) recognised that artificially prepared chemical compounds or "salts," when precipitated from solution, and metallic substances, such as bismuth, on consolidation from fusion, assume regular forms similar to natural crystals. Romé de l'Isle (1772), however, first showed the geometrical derivation of one form from another by the replacement of edges or angles and the constancy of the angles for each substance, assuming six "primitive forms"—viz. the cube, regular octahedron, regular tetrahedron, rhombohedron, octahedron with rhombic base and double six-sided pyramid. The contact-goniometer, a graduated semicircle with a movable radius, invented by Carangeau, assisted him in his work and enabled him to figure 500 forms as against 40 described by Linnæus about twelve years earlier. The abbé Réné Just Haüy, in 1784, by studying the laws of the natural cleavage of crystals, was led to the laws of symmetry and of whole numbers. He showed that when one edge or face of a crystal was replaced or truncated by a plane, all other geometrically similar edges or faces are similarly modified, and that the forms of crystals can be explained by supposing them to be built up of a definite number of layers of "integrant molecules," or brick-like bodies, and one, two, three,

CRYSTALLOGRAPHY.

1 Carangeau's Contact Goniometer. 2, 3 Rhombohedra of Dolomite with curved faces. 4 Pentagonal Dodecahedron of Pyrite from Traversella, with axes terminated by Crystals. 5, 6 Hopper-shaped Crystals of Rock-salt. 7 Cruciform macle of Staurolite. 8 Rhombic Dodecahedron. 9 Cubes of Pyrite striated parallel to edges of Pentagonal Dodecahedron. 10 Nugget of Gold with Octahedron having winged edges. 11 Hemihedral Crystal of Boracite. 12 to 17 Snow Crystals. 18 to 20 Ice-flowers, or negative Crystals. 19 Common Hexagonal form of Quartz. 22 Arrow-head shaped Twin of Selenite. 23 Polariscope appearance of Uniaxial Crystal. 24 Of Biaxial Crystal.

or some other definite number of layers to be removed in the modification of any face. Haüy also showed a close connection between angles and chemical composition, as exemplified in the four minerals baryte, witherite, celestine, and strontianite, the sulphate and carbonate respectively of barium and strontium, then classed together under the one name "heavy spar." In 1809 Wollaston, by his invention of the reflecting goniometer (q.v.), a graduated circle with a vernier and movable axis, in using which the angle is measured by obtaining reflections of signals in succession in the two faces forming it, rendered much greater accuracy possible. In the same year Weiss published an epoch-making dissertation referring all crystalline forms to four classes according to their axes, or lines round which they are uniformly disposed. These classes were—(1) The cube, regular octahedron, regular tetrahedron, and rhombic dodecahedron, with three equal axes at right angles; (2) the octahedron and right (upright) prism, with three axes at right angles, but only two equal; (3) the rhombohedron, six-sided prism, and double six-sided pyramid, with four axes, three equal, equally inclined and in one plane, and a fourth perpendicular to that plane; and (4) the octahedron and four-sided prisms of which the base is not square, with three unequal axes at right angles. Mohs, who arrived at these four classes independently, in 1820, named them the Cubic, Pyramidal, Rhombohedral, and Prismatic Systems, and in 1822 asserted, as the result of more precise measurement, the existence of two other systems, in one of which two of the axes are inclined, whilst in the other all three axes are so. In 1819 Sir David Brewster divided crystals into three classes according to their action upon polarised light (q.v.): (1) Those that are *isotropic* or singly-refracting, having no such action, which are those of the Cubic System; (2) those of the Pyramidal and Hexagonal Systems, which are *anisotropic* or doubly-refracting in all directions save one, the *optic axis*, and are hence termed *uniaxial;* and (3) those which have two optic axes, or are *biaxial.* Further study of these optical characters confirmed Mohs' conclusion that there are six systems of crystals, the two last to be discriminated being known as Monoclinic or Oblique and Triclinic or Anorthic. The correspondence of thermal and electrical properties with crystalline form has, since Brewster's time, still further demonstrated that the classification of Weiss and Mohs is no arbitrary grouping of mere abstract geometry. Fuchs in 1815, and Mitscherlich in 1822, showed that certain chemical elements and groupings of elements, or radicals, were *vicarious*, or could replace one another in a compound without appreciably affecting the crystalline form, though in basing upon this his doctrine of *isomorphism* (q.v.) the latter observer recognised the occurrence of minute differences in the angles.

Though exceptionally, as in dolomite and diamond (q.v.), crystals have curved faces, we now define a crystal as a solid bounded by plane surfaces which co-exist according to a definite geometrical law of symmetry, and exhibiting a tendency to split indefinitely in directions parallel to such surfaces or at fixed angles with them. [CRYSTALLOGRAPHY.]

Crystals are not confined absolutely to the dead mineral world, as they occur also in the cells of many plants, forming, for instance, no less than 80 per cent. of the dried tissue of the stems of some Cacti. These crystals consist of calcium sulphate, carbonate, phosphate, or most commonly oxalate, and occur either in spherical aggregations or in needle-like forms. [RAPHIDES.]

Crystal Palace, THE, is mainly the same structure as that of the Exhibition of 1851, the materials of which were sold to a company for £70,000 at the close of the year, and re-erected at Sydenham in Kent under the auspices of Sir Joseph Paxton, Owen Jones, and other architects. The Palace was opened by the Queen in 1854. It has since been constantly utilised for festivals and all kinds of exhibitions. In 1866 a fire in the north wing caused damage to the amount of £150,000.

Crystalline Schists, a term now generally extended to the whole series of intimately associated rocks that includes the gneiss, mica-schists, and other foliated rocks underlying the fossiliferous and distinctly stratified Cambrian system (q.v.). Among these are the crystalline limestones, serpentinites, and layers of graphite seen in the Laurentian rocks of Canada, and quartzites, hälleflintas, and ironstones in Wales and Scandinavia, in addition to the distinctly foliated or schistose gneisses, mica-schists, talc-schists, etc., that form most of the Scottish Highlands. The total thickness of these rocks is unknown, and individual layers are very inconstant in thickness, though the series as a whole presents much the same characters all over the world. No undoubted trace of life occurs in it, *Eozoon* (q.v.) being a much-debated structure either mineral or foraminiferal, and the fibrous texture of some graphite not being necessarily a sign of vegetable origin. According to one theory of their origin, these rocks are the result of metamorphism of ordinary, possibly Cambrian, sedimentary, and volcanic material; the limestone may have been of animal origin; the graphite metamorphosed coal; and the iron oxides may have been precipitated by organic acids. Against this view may be urged the uniformly complete character of the supposed metamorphism and the fact that fragments of these rocks exhibiting the same texture as the main mass are found in Cambrian conglomerates, arguing that if any such metamorphism occurred it must have been in pre-Cambrian times. The opposing view seems to be that these rocks represent part at least of the primitive crust of the earth or were thrown down as precipitates or sublimates from a primeval atmosphere under conditions of temperature and pressure unlike anything that has since prevailed. It is chemically possible that carbonate of lime and oxide of iron may be so thrown down and graphite possibly formed directly from hydrocarbon vapour; but the interlamination of limestone and serpentine is one among several serious difficulties in the way of this view.

Crystallites, microscopic particles occurring in vitreous rocks and in some artificial slags

representing incipient crystallisation. They include *globulites*, spherical particles, sometimes concentric or radiate; *trichites*, hair-like bodies, straight, curved, or looped; *crystalloids* or grouped crystallites approximating to true crystalline forms; and *microliths*, which are apparently merely very minute crystals, as they may exhibit not only distinct faces and angles but double refraction, dichroism, and other characters of crystals. Crystallites are often in layers marking the flow of the glass when liquid, and as they increase in number the glass becomes *devitrified*, as, for example, when barley-sugar, losing its clear, brittle character, becomes cloudy, soft, and granular, becoming, in fact, sugar-candy.

Crystallography, the science of crystalline form, is a branch of the geometry of solids applied to the elucidation of the forms actually exhibited by natural inorganic substances and the cognate bodies built up in the laboratory. The history of the development of this science having been sketched in the article Crystal (q.v.), we need here only give an outline of its principles as now understood. Though, as we then saw, optical, thermal, and electrical characters are intimately related to crystalline form, crystallography deals primarily with form. In form, as Steno practically showed, linear dimensions obey no law in natural crystals. Though their angles are determinate, they are not geometrically regular solids, their faces may be of any size. The primary characteristic of crystals, however, is symmetry; their particles are symmetrically arranged with reference to certain dominant lines or *axes*, so that their bounding-planes or *faces* make angles constant for each substance, and when, as is usual, they exhibit a tendency to splitting or *cleavage*, it is in directions symmetrically arranged as are their faces. The facts of crystallography are, therefore, mainly obtained by the measurement of the angles of crystals. The most mathematically satisfactory explanation of crystalline form is that elaborated by Professor W. H. Miller in 1839. In this system the position in space of any face of any crystal is determined by its relation to three axes of indefinite length, which intersect at a point called the *origin* within the crystal. As these axes are not all in one plane, every plane in the universe must cut at least one of the three, and its position can be represented by a *symbol* of three algebraical *indices*. All parallel planes on one side of the origin have the same symbol, which implies the principle that linear dimensions are subject to no law. One of Haüy's chief discoveries was that the *intercepts* or distances from the origin along the three axes at which faces cut the axes are in the ratios of whole numbers, generally less than seven. In each of the six crystallographic systems some one plane is taken as a plane of reference, and is known as the *parametral plane*. It is one cutting all the three axes at intercepts, having a constant ratio in each system, and the simplest whole numbers expressing these ratios are called the *parameters*.

That the three crystallographic axes are not purely imaginary, but represent lines along which crystallisation has acted, is shown by the hollow, skeleton, or hopper-shaped crystals of rock-salt, and by such crystals as those pentagonal dodecahedra of pyrite from Traversella, in which each axis is terminated at each end by a similar but smaller dodecahedron.

The law of symmetry may even control two, four, or more distinct crystals aggregated together so that they mutually intersect symmetrically and form a *twin-crystal*, or *macle*, which will often have re-entering angles, or angles the apices of which point towards the crystal, as in the arrow-shaped macles of selenite, the cruciform ones of staurolite, and the three- or six-rayed forms of snow. These latter forms are reproduced in the "negative" crystals, or ice-flowers, hollows melted by Professor Tyndall from the centre of a block of ice by a beam of electricity.

On the other hand, there are partial exceptions to symmetry in what are termed *hemihedral* or *merosymmetrical* forms, such as those cubes of boracite (q.v.), in which four out of their eight angles are truncated. Such forms exhibit differences of thermo-electric properties corresponding to these differences of form.

The six systems are—(1) The *Cubic*, tesseral or monometric, with the most perfect symmetry, nine *planes of symmetry*, its three axes at right angles and its three parameters equal, including the *cube*, as in rock-salt, fluor, and pyrite; the *regular* or equilateral *octahedron*, as in magnetite; the *rhombic dodecahedron*, as in garnet, and many other forms; (2) the *Pyramidal*, tetragonal or dimetric, including the *right-square prism* and *square-based octahedron*, with five symmetral planes, axes at right angles, and two parameters equal, exemplified by tinstone; (3) the *Rhombohedral*, or hexagonal, including the *rhombohedron*, with three planes of symmetry, the *six-sided prism*, with seven, the *scalenohedron*, and many other forms, with axes at equal but not right angles and equal parameters, and exemplified by calcite, quartz, beryl, etc.; (4) the *Prismatic*, rhombic or trimetric, with three symmetral planes, axes at right angles and unequal parameters, including *rhombic prisms* and octahedra with rhombic bases, as in sulphur; (5) the *Oblique*, or monoclinic, with one plane of symmetry, only one axis at right angles to each of the others, and unequal parameters, including *oblique prisms*, as in gypsum, augite, and hornblende; and (6) the *Anorthic*, or triclinic, with no plane of symmetry, axes all at unequal angles and parameters unequal, including certain *doubly oblique* forms, as in blue vitriol. (*See* Plate, page 193.)

Crystalloids. [CRYSTALLITES.]

Csaba, a town of Hungary, beyond the Theiss, distant 7 miles from Békes. Corn and lint are grown in the district, and there is a brisk trade in cattle, sheep, silkworms, fruit, wine, hemp, and flax.

Csoma de Köros, ALEXANDER, a Transylvanian traveller and philologist, was born in 1784 in the village of Köros, and after studying at Göttingen, started in 1820 on an eastern philological tour, visiting Egypt, Persia, and Tibet. On his arrival in Calcutta, in 1831, he devoted several

years to the compilation of his *Tibetan and English Dictionary* and *Tibetan Grammar*, and after acting as librarian to the Asiatic Society, died at Darjeeling in 1836. He was indefatigable in his research after all that threw light upon the origin of the Magyar race.

Csongrad, a town of Hungary in the county of Csongrad, at the junction of the Theiss and Köros, 22 miles N. of Szegedin. It is surrounded by fertile, but marshy and unhealthy plains.

Ctenocyst, the name of the sensory organ placed at the aboral end of the Ctenophora (q.v.); it is doubtless auditory in function.

Ctenoid Scales. [Cycloid Scales.]

Ctenophora (or "Comb Bearers"), a class of Cœlenterata, the members of which are provided with eight bands of cilia, known as ctenophores. They are non-colonial and free-swimming, and are all marine; as a rule they are globular in form, the mouth being situated at one pole and the two excretory apertures at the other; some, however, like *Cestus* or "Venus' Ribbon," are long and band-like. The mouth opens to a flat stomach, at the farther end of which is a "funnel," from which rise two canals ("perradial"); these bifurcate, and from each of the four "interradial vessels" thus formed there is given off a pair of vessels which lead to eight "ctenophoral vessels," lying below the ciliated plates. At the opposite pole to the mouth are the two openings of the excretory system, and between these is a small sensory organ or "ctenocyst," which is probably auditory. The Ctenophora all live on the surface of the sea; most of them swim by the action of the ciliated plates, but *Cestus* does so by snake-like undulations of its long ribbon-shaped body; as a rule they are small, but Cestus may be as much as five feet in length. *Pleurobrachia* is a very typical representative of the class, and is common all round the English coast; this and *Beroe*, which differs from it by the absence of the pair of long delicate tentacles, are both about an inch in length, and are usually mistaken for jellyfish, owing to their transparency and gelatinous consistency. The Ctenophora are of interest, as they resemble some worms of the order Polyclada (q.v.) in the possession of the mass of otoliths at the aboral pole and of the ciliated bands; an attempt has, therefore, been made to ally them with this group.

Ctenostomata, a sub-order of Bryozoa, in which the (Zoarium) colony is never calcareous, and the orifice is closed by a series of processes or setæ. The best known English species is *Alcyonidium gelatinosum* (Linn.), popularly known as "Pipe-weed," "Pudding-weed," or "Sea Ragged Stuff"; this is common all round the English coasts, and may be recognised by its fleshy, gelatinous consistency, its yellowish brown colour, dotted over with the small stellate points that mark the openings of the individual polypides and its irregular tuft-like mode of growth. The small delicate tufts of the "Sea Silk Coralline" (*Vesicularia spinosa*, Linn.) and the dense encrusting masses of the "Nit Coralline" (*Amathia lendigera*, Linn.) are also well known members of the group, which includes over thirty English species. The recent discovery of spicules in *Alcyonidium* suggests that this sub-order was derived from a form that had a calcareous skeleton.

Ctesias, a Greek physician and historian, born at Cnidus in Caria, was present B.C. 401 at the battle of Cunaxa, where the younger Cyrus was defeated by his brother Artaxerxes. During his stay at the Persian Court he laid the foundation of a valuable work in the Ionic dialect, entitled *Persika*, being a history of the Assyrian and Persian monarchies. The fragments of this work which have been preserved are, in many instances, at variance with the records of other authors, notably Herodotus and Berosius. He died in Cnidus.

Cuba is the largest of the islands that lie between North and South America; its size is about that of England, and its shape long and narrow and curved like an arch. By some prehistoric cataclysm it must have been severed from the continent with the other Antilles. Several mountainous groups rise on the land, but they are not of any great height, and there are many streams flowing to the northern or southern coasts, which are indented by numerous and excellent harbours. The fertility of the soil is marvellous for all sorts of tropical produce; and Cuba enjoys, indeed, some natural monopolies, *e.g.* its unrivalled tobacco, while the mineral wealth is equally immense. The sugar crop is now more than 800,000 tons a year; the total *exports* are worth about £30,000,000, and the *imports* about £9,000,000. Only about a third of the island is under cultivation, and the *population* is about 1,600,000 inhabitants. No other country in the world with equal population produces so much. One-third of the population belongs to the African race; the other two-thirds are of Spanish descent. Travellers describe them as very hospitable and intelligent, and in science and literature many have been distinguished. Two *seasons* are known in the country: the rainy and the dry; the first season is hot, the other delightful; and if sanitary rules were properly enforced, all the island would be very healthy. Unhappily such is not at present the case. Havana, Matanzas, Cárdenas, Cienfuegos, Sagua, and Santiago are the principal cities.

Columbus discovered this island in his first voyage. Velazquez occupied it in 1511, dividing all the land and its enslaved aboriginals, a peaceful delicate race, between his Spanish followers. The monk Las Casas has described the horrors of that epoch. The natives were soon extinguished by the cruelty of their masters, who afterwards imported negroes as substitutes. English and French pirates frequently attacked the Spaniards of Cuba from the end of the 16th century to the middle of the 18th. In 1762 Sir George Pocock, with 200 ships and 18,000 sailors, and the Earl of Albemarle, with 14,000 soldiers, conquered Havana, the capital of the island; nine months after it was given back to Spain in exchange for Florida. England did not understand the strategical and commercial value of her conquest. Spain turned her attention

to Cuba after she lost all her other American colonies, but her rule was so despotic that in 1868 a war for freedom was commenced, which raged with great ferocity and destruction of life and property for ten years until it ended by a compact of the Government with the rebels. The Cubans now do not appear to be very satisfied with their rulers, and the island will in due time become independent, or will take rank as one of the States of the North American Union, with which it is closely connected by economical ties.

Cube, in *Geometry*, a regular six-sided solid, with all its faces perfect squares. It is a square prism, with height equal to the length of either side of the base. It thus has twelve edges all of equal length. Its volume is obtained by cubing the length of an edge. This is $\frac{2}{11}$ths of the volume of the enclosed sphere. In *Arithmetic* it is the number obtained by multiplying a number by itself three times. The process of cube-root is that of obtaining the original number from its cube.

Cubebs, a name originating in Arab medicine for the dried fruits of species of *Cubeba*, a genus allied to the peppers, especially of *C. officinalis*, a woody climber in Borneo, Java, and Sumatra. The fruits are globose, $\frac{1}{5}$ inch in diameter, greyish or black, and wrinkled, and grow in spikes of 40 or 50. They are agreeably aromatic, pungent, and slightly bitter, yielding 15 per cent. of a volatile oil containing a camphor, a characteristic alkaloid, *cubebin*, and an acid, *cubebic*. Britain imports about 60 tons annually *riâ* Singapore. The drug is employed to arrest excessive mucous urethral discharge.

Cubic Equations in algebra are such as contain the cube of the unknown quantity, but no higher power thereof. Methods are available for the solution of any cubic equation.

Cubitt, Sir William, civil engineer, born in 1785 at Dilham in Norfolk, was the inventor of the treadmill. In 1812 he entered the service of Messrs. Ransome, of Ipswich, and soon became their chief engineer. Continuing in that post until 1826, he then removed to London, having previously become a member of the Institution of Civil Engineers in 1823. He assisted in the erection of the Crystal Palace in 1851, was knighted for his services in the same year, and died at Clapham in 1861.

Cuckoo, a book-name for the *Cuculidæ*, in Huxley's classification ranged under the *Coccygomorphæ*, and in older systems placed among the Picarian birds. The family contains 180 species, arranged in 35 genera, and characterised by a slender body, wings of moderate length, a long graduated tail of from eight to twelve feathers, the beak with sharp edges, and the feet generally long and powerful, with short toes. They abound in warm climates, but in cold and temperate regions they are sparsely distributed, or appear only as visitors. Many of them are parasitic in habit, and some have a strange resemblance to other birds of widely different genera. Thus the Common Cuckoo is very like a hawk, and in some parts of England it is believed that it actually does change into a hawk in the winter; and one of the Bush Cuckoos (*Carpococcyx radiatus*) closely resembles a pheasant in appearance and gait. The type-genus (*Cuculus*) contains about 20 species, distributed through the Palæarctic, Ethiopian, and Oriental regions, some of them ranging to the Moluccas and Australia. They have the bill broad at the base, the wings long and pointed, the upper tail-coverts long, the feet slender and very short, and the legs feathered behind almost to the toes. All are parasitic. The Common Cuckoo (*C. canorus*) breeds in all the northern portions of the Old World, visiting India, China, Java, and South-western Africa in its southern migration. The male is about 14 inches long, deep ash-grey above, greyish white with black markings below; the neck, cheeks, throat, pure ash-grey; tail feathers, black, spotted with white. The eyes are bright yellow, as are the feet, the beak with a yellowish tinge at the base. The female is about an inch shorter, but has scarcely perceptible reddish stripes on the back and under side of the neck. The young birds are blackish, mottled with yellow and grey, with a good deal of white about the hind neck. The Cuckoo, which arrives in England in April or May and leaves again in August or September, is probably the best known of our feathered visitants. The cry of the male, whence the bird is named, is familiar to everyone. The female has two calls—one resembling that of the male, but sharper, and one which Brehm syllables *kwikwikwik*, that seems to exert an extraordinary influence on all the males within hearing. Old birds feed entirely on insects and their larvæ, seemingly preferring hairy caterpillars. These they devour in great numbers, and the hairs adhere so closely to the mucous membrane of the stomach as to convey the impression that that organ is covered with hairs. The young birds will occasionally feed on berries. The flight is light and elegant, somewhat like that of a falcon.

The Cuckoo's parasitic habit has been known since the days of Aristotle. The hen bird lays her eggs singly on the ground—sometimes as many as eight in the season—taking each egg as soon as laid in her bill and depositing it in the nest of some bird that feeds its own young on insects. Some fifty birds are said to act as unconscious foster-parents to young cuckoos, but the eggs are most frequently deposited in the nests of the hedge sparrow, water wagtail, titlark, yellow ammer, green linnet, and whinchat. The fact that hen cuckoos have been shot with eggs in their bills has given rise to the story, which has no foundation in fact, that they suck the eggs of other birds. The young Cuckoo frequently repays the hospitality accorded it by ejecting the rightful brood, and it always monopolises the bulk of the food, of course to their loss. To account for the parasitism of these birds Darwin supposes that the progenitor of the European Cuckoo occasionally laid an egg in another bird's nest, that some advantage accrued to the old bird or to the fostered young, and that "the young thus reared would be apt to follow by inheritance the occasional and aberrant habit of their mother."

Cuckoo Bees, a group of bees principally belonging to the genus *Nomada*. Their popular name

is derived from their habit of laying their eggs in the nests of other bees, so that the young feed on the honey stored up by the host. As these bees do not collect pollen for the manufacture of comb, their hind legs are simpler in structure, and lack the brush-like apparatus with which most bees are provided. Some of the "Cuckoo-Bees" belong to the genus *Apathus*. These are parasitic on the Humble Bees, which they closely resemble in appearance. They are, however, only bisexual. [BEE.]

Cuckoo Flower, a popular name applied to various flowers that appear in spring about the same time as the cuckoo. The chief of them are *Cardamine pratensis*, also known as Ladies'-smocks, *Lychnis Flos-cuculi*, now better known as Ragged Robin, and *Stellaria Holostea*, the greater stitchwort.

Cuckoo Pint, a popular name for the common British plant, *Arum maculatum* (q.v.).

Cuckoo Spit, the name of the white, frothy mass that surrounds the larva of one of the Frog-hoppers (q.v.) or *Cercopidæ*. It occurs most commonly on grass and green bushes. The larva and adult are both yellow in colour, and the latter has two pale bands on the fore wings.

Cucumaria, a well-known genus of Holothurians (q.v.) or SEA CUCUMBERS. It is probably the best known of those with arborescent tentacles. The presence of overlapping calcareous plates is of much interest.

Cucumber (*Cucumis sativus*), a trailing annual plant belonging to the order *Cucurbitaceæ*, the gourd, melon, and pumpkin family. It is a native of Asia, if not also of Egypt, where it has been cultivated for more than 3,000 years. Pliny records that Tiberius had cucumbers daily in both summer and winter. Its stem is rough, its leaves three to five-lobed and hairy; it has unbranched tendrils, monœcious flowers with large orange funnel-shaped corollas, sinuous anthers, and a long inferior ovary, one-chambered with three inrolled parietal placentas. The fruit is slightly spinous except in the short ovoid Russian variety. Small young fruits are pickled under the name of *gherkins*, and larger ones are extensively eaten as salad or cooked. The plant does best in a moist atmosphere at a temperature between 75° and 80° F. with plenty of light, so that it is generally grown in England in hot-beds; but thousands of bushels are grown for the London market in open fields at Sandy in Bedfordshire. Seeds several years old are said to produce the best plants. In Persia, Cashmere, and China, the cucumber is grown on mud-covered rafts on the lakes. The squirting cucumber, *Ecbalium elaterium*, an allied plant, yields the drug elaterium (q.v.).

Cucuta, the capital of the district of Cucuta, in New Granada, in the United States of Columbia, is situated on the Venezuelan frontier, 28 miles N.N.E. of Pamplona. The surrounding valleys, where sugar-cane, indigo, and cacao tree flourish, are remarkably fertile.

Cudbear, a colouring matter obtained as a reddish brown powder from various lichens (*e.g. Lecanora tinctoria*). It was formerly much used for wool dyeing, but has now been almost entirely replaced by the artificial aniline dyes. It is still employed, however, in mixtures for the production of some shades of brown.

Cuddapah, a town of British India, 139 miles N.W. of Madras, capital of the district of Cuddapah. Its climate is oppressively hot. The district ceded to the British in 1800 is watered by the river Pennair and its tributaries, and occupies an area of 8,745 square miles. The hill country is rich in minerals.

Cudworth, RALPH, divine and philosopher, born at Aller, Somersetshire, in 1617, was educated at Cambridge, and became successively fellow of Emmanuel College, master of Clare Hall, regius professor of Hebrew, rector of North Cadbury, Somerset, master of Christ Church, rector of Ashwell, and in 1678 prebendary of Gloucester. He held a foremost place among the philosophers of his time known as the "Cambridge Platonists." His principal work was the *True Intellectual System of the Universe*, which combined the Platonic theory of ideas with the doctrine of an omnipotent and beneficent God controlling all things, as opposed to the atheism or materialism of Democritus, Hobbes, and other writers. His fairness in weighing the arguments for and against different religious beliefs caused him to be charged with want of orthodoxy, notably by Dryden. Among his other principal writings are his *Treatise concerning Eternal and Immutable Morality*, *Discourse concerning the True Notion of the Lord's Supper*, and *The Union of Christ and Church a Shadow*. He died in 1688 at Christ's College.

Cuenca. 1. Capital of the province of Cuenca, in Ecuador, South America, department of Assuay, stands in a plain 8,640 feet above the sea level, 70 miles S.E. of Guayaquil. It contains a cathedral, university, and other important buildings. Its trade consists chiefly of hats, bark, cheese, confectionery, and agricultural products. 2. Capital of a province of the same name in Spain, contains a cathedral and numerous other ecclesiastical buildings. It is built on high ground between two mountains, at the foot of which flow the Jucar and Huecar. It is a walled town 84 miles S.E. of Madrid, with steep and winding streets. The district, 6,726 square miles in area, produces copper, silver, iron, coal, alum, honey, and timber.

Cuernavaca, a town of Mexico, capital of the state of Morelos, 40 miles S. of the city of Mexico, is pleasantly situated, and contains numerous handsome buildings. It has a refining trade in sugar and brandy.

Cuevas de Vera, a town of Spain in Andalusia, on the right bank of the Almanzora, about 43 miles N.E. of Almeria. There are important silver mines in the vicinity.

Cuirassiers, heavy dragoons, part of whose equipment consists of a breastplate and backpiece

of steel, or other substance, as for instance in the case of the Cent Gardes of Napoleon III., of aluminium. In the English army, though the name is not used, the equipment has been used since Waterloo on all ceremonial occasions, though not upon active service, by the Life Guards and Horse Guards. Most European armies have Cuirassiers.

Cujacius, or CUJAS, Jacques, French jurist, son of a tanner, was born at Toulouse in 1520. His industry overcame all obstacles to learning, his attention being chiefly devoted to the study of Roman law, on which he commenced to lecture in 1547. Elected professor at Cahors in 1554, he continued his lectures there, and in other towns, until the year 1567, and finally took up his abode at Bourges in 1577, where he continued his instructions until his death in 1590. He left voluminous works, consisting of commentaries and expositions of the Roman law.

Culdees, either from Celtic words meaning *servants of God*, or from Latin ones meaning *worshippers of God*, were an order of irregular monks who were found in parts of England, Scotland, and Wales from the ninth or tenth century to the fourteenth or fifteenth. They have owed their remembrance chiefly to a mistaken idea that they formed a link between later times and an original and pure form of Christianity which prevailed in these countries in very early times. Many of them were absorbed into regular orders, and others were dispersed with or without compensation.

Cullen, PAUL, CARDINAL, D.D., was born in 1803 in county Kildare, Ireland, and educated at Shackleton School, Ballytore, at Carlow College, and the Urban College of the Propaganda at Rome, of which he was appointed rector in 1848. After saving the property of the Propaganda during the supremacy of the triumvirate in the pontifical states, by invoking the protection of American ships of war, on the death of the primate in 1849 Cullen was consecrated as his successor in 1850, and two years later was translated to the archbishopric of Dublin on the death of Dr. Murray, and in 1866 was created a cardinal prince, under the title of San Pietro in Montorio. He was a churchman of the advanced ultramontane school, a rigid disciplinarian and vigorous opponent of all secret societies and the system of mixed education then in force. He was active in founding Catholic schools, colleges, and other institutions. His death occurred in Dublin in 1878.

Cullen, WILLIAM, physician, was born at Hamilton, Lanark, in 1710, and studied at Glasgow University. In 1729 he became surgeon in a merchant ship trading to the West Indies, and on his return acted as assistant to an apothecary in London. Continuing to study assiduously, in 1736 he started practice on his own account at Hamilton. After taking his M.D. at Glasgow in 1740, four years later, having married in the interval, he removed to that town, where he founded a medical school, and had as his pupil Joseph Black, the well-known scientist. In 1755 he was appointed professor of chemistry at Edinburgh, where his chemical and clinical lectures were soon largely attended, and here, at a later date, he successively held the chairs of materia medica, and theoretical and practical medicine. He was president of the Edinburgh College of Physicians from 1773 to 1775, and died in 1790. His principal works are his *First Lines of the Practice of Physic*, *Institutions of Medicine*, *Synopsis Nosologiæ Methodicæ*, and his *Treatise of the Materia Medica*.

Cullera, a town of Spain, at the mouth of the Jucar, 24 to 25 miles S.S.E. of the town of Valencia. It is a place of some military importance, and has a thriving export trade in grain, wine, fruits, etc.

Culloden, or DRUMMOSSIE MOOR, is situated from 3 to 5 miles E. of Inverness, and consists of a moory ridge, famous for the defeat of the Young Pretender by the Duke of Cumberland in 1746. A monument marks the site of the battle.

Culm. 1. In *Botany* culm is a term sometimes used for the slender stems of grasses which mostly have solid nodes and elongated hollow internodes, reaching in the bamboos considerable size. [STEM.] 2. In *Geology* culm is applied to an inferior slaty or stony variety of coal, worked in Pembrokeshire and North Devon.

Culmination, in *Astronomy*, is the instant at which a star crosses the meridian. The sun, for instance, culminates at what we call mid-day. Knowing the instant at which a star culminates at Greenwich, or any other standard meridian, observation of the time at which it culminates elsewhere affords a method of determining the longitude of the spot.

Culpeper, NICHOLAS, herbalist and astrologist, was born in London in 1616, and studied at Cambridge. In 1640, after serving as apprentice to an apothecary in Bishopsgate, he opened an establishment in Spitalfields as an astrologer. During the Civil war he sided with Parliament, and in 1649 incurred the enmity of the medical faculty by his publication of a *Physical Directory*, or a *Translation of the London Dispensatory*. Numerous works are attributed to Culpeper, but their authenticity is doubtful. He died in 1653–4.

Culverin (Fr. *couleuvrine*, from *couleuvre*, serpent), an ancient name for a cannon. In the early part of the sixteenth century it strictly denoted a heavy gun very much resembling the later much-praised "long eighteen." The word is also used loosely to denote any small early gun.

Culvert, in *Civil Engineering*, is a water-drain under a road, railway, or embankment. It is built of stone or brickwork, arched both at top and bottom. Its section must be designed so as to afford a sufficiently large channel for any quantity of water that is likely to flow through.

Culverwel, NATHANIEL, divine, was born in Middlesex, and graduated at Cambridge in 1633. During the Civil war his sympathies lay with the Parliament. His writings are vigorous, and possess great descriptive power. The most noteworthy of his works are his *Light of Nature*, *Sacred Optics*, *Spiritual Opties*, and the *Worth of Souls*. He was

a contemporary of Cudworth, Whichcote, and John Smith, and was one of the Cambridge Platonists.

Cumæ, a maritime city of Campania in Italy, the legendary abode of the Sibyl, stated by Strabo to be the oldest of the Greek colonies in that country, and probably founded by colonists from Chalcis and Cyme in Asia Minor. By 700 B.C. it attained to an extraordinary degree of prosperity, owing to the fertility of its soil and its excellent harbours, and some twenty years before the usurpation of the tyrant Aristodemus, about 505 B.C., was powerful enough to repulse a formidable invasion of Etruscan and other hostile tribes. In 474 B.C. it gained the signal victory of Hieron over the Tyrrhenian and Carthaginian fleets, but was in turn taken by storm by the Samnites 420 B.C., its defenders being slain or reduced to slavery. Subsequently, it received the Roman franchise 338 B.C.

Cumana, or NEW TOLEDO, a maritime city of Venezuela, capital of the state of Cumana, at the mouth of the Manzanares, founded by Diego Castellon in 1523. It has a good roadstead, a healthy climate, and fair export trade, but is subject to earthquakes.

Cumberland. 1. A county in the extreme N.W. of England, is bounded on the N. and N.W. by Scotland, on the S. by Lancashire, Westmoreland, Durham, and Northumberland, on the E. and N.E. by Northumberland and Durham, and on the W. by the Irish Sea. Its surface is mountainous and on the whole sterile, but it abounds in lakes and rivers. The principal lakes are Derwentwater, Ulleswater, Wastwater, Thirlmere, Bassenthwaite, and Buttermere, and the principal rivers the Eden, the Irthing, the Esk, and the Derwent. There are two distinct ranges of mountains, one running N., the other S., of which the most lofty elevations are Scaw Fell Pike (3,210 feet), Scaw Fell (3,162), Helvellyn (3,118), Skiddaw (3,058), Bow Fell (2,960), and Great Gable (2,949). Valuable minerals are to be found in most of the moors and mountains, including lead, iron, coal, limestone, slate, quartz, spar marble, silver, and copper. Wheat, oats, turnips, and barley form the staple crops. The principal manufactures are earthenware, wool, flax, and cotton. The county has an area of 1,564 square miles, and is divided into four parliamentary divisions, each returning a member. 2. A river of the United States, rises in the Cumberland mountains, Kentucky, flows through the north of Tennessee, re-enters Kentucky, and falls into the Ohio, 59 miles above the junction of the Ohio and Mississippi.

Cumberland, RICHARD, Bishop of Peterborough, was born in London in 1632, and educated at St. Paul's school and Cambridge. After holding different preferments, he became Bishop of Peterborough in 1691. He was the author of an *Essay on the Jewish Weights and Measures, Origines Gentium Antiquissimæ*, and a work on moral philosophy, entitled *An Inquiry into the Laws of Nature*. He was an indefatigable worker, a profound scholar, and of a retiring disposition. He died in 1718.

Cumberland, WILLIAM AUGUSTUS, DUKE OF, second son of George II., was born in 1721, wounded at Dettingen in 1743, and defeated at Fontenoy, in Flanders, by Marshal Saxe in 1745. In 1746 he totally routed the forces of the younger Pretender at Culloden, following up his victory with great cruelty. His disgraceful capitulation at Closter-Seven in 1757 closed his military career. He died at Windsor in 1765.

Cumberland Presbyterians, a sect originating in 1810 in Kentucky, U.S., through a disagreement of the Presbytery of Cumberland with the Synod of the State as to the qualifications of candidates for the pastorate. They diverge considerably in doctrine from the main body of Presbyterians.

Cumin, or CUMMIN (*Cuminum Cyminum*), an annual umbelliferous herb, indigenous to Upper Egypt, with multifid leaves having filiform segments and elongated fruits, the halves of which (mericarps), erroneously called "seeds," are used in the manufacture of curry powder, and in veterinary medicine. These "seeds" are larger, lighter in colour, and hotter in taste than caraways, being two lines in length, and each of them has nine longitudinal ridges instead of five, with an oil-channel or vitta beneath each ridge. Cumin was esteemed as a carminative in ancient times, and as a spice in the Middle Ages. Britain now imports from 400 to 500 tons annually, chiefly from Mogador, Malta, and Sicily.

Cumming, JOHN, D.D., Scottish divine, was born in the parish of Fintray in Aberdeenshire in 1807, and educated at the Aberdeen grammar school and university. In 1832, having been licensed to preach, he came to London and drew together large congregations at the National Scottish church, Crown Court, Covent Garden. He was created a D.D. of Edinburgh in 1844, and thenceforth led an active life, preaching, founding benevolent institutions, and engaging in polemical discussions, both verbally and with his pen. He was an ultra-Protestant, and a strong opponent of the Free Church party in Scotland. His writings on prophecy are the best known of his numerous publications. He died in 1881.

Cumming, ROUALEYN GEORGE GORDON, the African lion hunter, was born in 1820, educated at Eton, and in 1838 entered the East India Company's service. Resigning his commission in 1840, after serving in Canada and the Cape Mounted Rifles at the close of 1843 he organised and carried out a five years' hunting expedition in the interior of South Africa. He returned to England in 1848, and delivered lectures on his adventures. His chief works are his *Five Years of a Hunter's Life*, and *The Lion Hunter of South Africa*. He died at Fort Augustus in 1866.

Cummins, MARIA S., American authoress, was born in 1827, and is best known by her novel, *The Lamplighter*. Besides contributions to the magazines, she also published other works of fiction, entitled *Haunted Hearts*, *El Fureidis*, and *Mabel Vaughan*. She died in 1866.

Cunard, Sir Samuel, Bart., shipowner, was born in 1787 at Halifax, Nova Scotia. He originated, and. in conjunction with Mr. George Burns, of Glasgow, and Mr. David MacIver, of Liverpool, carried out the scheme of a steam mail service to run between England and America, called the British and North American Royal Mail Steam Packet Company. In 1840 the *Britannia*, carrying the mails, steamed out of Liverpool, and arrived in Boston in less than fifteen days. In 1855 the *Persia*, the first iron boat, was launched. The *Scotia*, the last paddle-steamer of the Atlantic service, was put on in 1862 and withdrawn in 1869. It was long the boast of the Company that they had never lost a life or a letter. A baronetcy was conferred on the founder of the Cunard line in 1859. He died in London in 1865.

Cunas, aborigines of the Isthmus of Darien, Central America, in the Tuyra, Tanera, and Lower Atrato valleys. They call themselves Tulé, and form a confederacy with the San Blas Indians, their independence being recognised, or at least tolerated by the Colombian Government. They are "of middle height but robust, with light brown complexion, and abundant black hair, worn very long by the men and girls, but cut short by the married women. The Tulé language shows some affinity with Carib.

Cunaxa, the battle-ground of Cyrus the Younger and his brother Artaxerxes, 401 B.C., distant 500 stadia from Babylon.

Cundinamarca, a central state of the United States of Columbia, capital Bogota, with an area of 8,455 square miles and a mixed population. The eastern surface is flat, the western mountainous. Minerals are plentiful, and the soil in many parts is highly productive.

Cuneiform (Lat. for *wedge-shaped*), a kind of writing thought to have been practised as early as 3000 B.C., and to have been introduced into Mesopotamia and Persia, and to have been employed largely over western Asia. At first picture-writing, in which each object spoken of was represented, the signs became conventional and permanent, and underwent modification and simplification to save time and trouble on the part of the scribes. The peculiar wedge or arrow shape probably arose from the form of the instrument with which the signs were impressed upon clay, which was the usual medium employed. Different degrees of development have led to the classification into Archaic, Hieratic, Assyrian, and later Babylonian. The Persian arrow-headed writing of the time of Darius employs forty different characters.

Cuneiform Bone. [Wrist.]

Cunningham, Alexander, Major-General, C.S.I., soldier, was born in London in 1814, and educated at Christ's Hospital and Addiscombe. Obtaining a commission in the Engineers in 1831, he became, successively, aide-de-camp to the Governor-General of India in 1834, engineer to the King of Oudh in 1840 and to the North-Western Provinces in 1858, and in 1870 archæological surveyor-general of India. In 1871 the order of Companion of the Star of India was conferred upon him in recognition of his services. Among his works are *The Bhilsa Topes; or, Buddhist Monuments of Central India, Ladak, Physical, Statistical, and Historical*, and various papers on Indian antiquities.

Cunningham, Allan, poet and author, was born at Keir, Dumfriesshire, in 1784. He is best known as a close imitator of the poet Burns, in whose neighbourhood he lived at Dalwinston. Commencing life as a stonemason, he soon devoted himself to literary work. He became a friend of Hogg, the "Ettrick shepherd," and later of Sir Walter Scott. In 1810 a volume appeared by Cromek, a London publisher, called *Remains of Nithsdale and Galloway Song*, purporting to be a collection of stray writings of Burns, but which in reality almost entirely emanated from the brain of Cunningham. At the solicitation of Cromek he now came to London, where he married, and earned a living by miscellaneous literary work and employment given by the sculptors Bubb and Chantrey, and formed the acquaintance of the leading literary men of the day, including Carlyle, Southey, Wilson, and Lockhart. He died in 1842. His chief claim to literary fame lies in some spirited poems—*The Mermaid of Galloway*, *A Wet Sheet and a Flowing Sea*, *It's Hame and it's Hame*, and local tales relating to his district, as well as a work entitled *Lives of the Most Famous British Painters, Sculptors, and Architects.*

Cunningham, John, D.D., LL.D., Scottish divine, was born at Paisley in 1819, and was educated at the Universities of Glasgow and Edinburgh. In 1845 he became minister of the parish of Crieff, and in 1886, on the death of Principal Tulloch, of St. Mary's College, St. Andrew's, was nominated his successor. Besides contributing to numerous magazines, including *Macmillan's Magazine*, the *Westminster*, *Edinburgh*, and *North British Reviews*, he is the author of the *Church History of Scotland* (1859), *The Quakers*, *The Growth of the Church in its Organisation and Institutions.*

Cup (Gk. *kupellon*) represents first a hollow, then a hollowed vessel for holding liquids. The word is also employed to denote certain compounded beverages, such as champagne cup, claret cup, cider cup, beer cup, each taking its name from the principal ingredient.

Cup Markings, a collective name for cup-like depressions on prehistoric sepulchral monuments and on stone weapons and implements. In the former case they are of two kinds—simple cups, and cups surrounded by concentric circles, and nothing is known of their origin or purpose. In the latter they seem to have served to afford a firm grip, and in some instances show that the stone was used as a journal or bearing.

Cupar, or Cupar-Fife, a town of Fife, capital of the shire on the Eden, and an ancient royal borough, returning a member to Parliament in conjunction with five other towns. It is 12¾ miles S. of Dundee, and 30 N.N.E. of Edinburgh. It was

formerly the seat of the courts of justice for Fife. On the summit of School Hill once stood the castle of the Macduffs, Earls of Fife, and here religious representations were at a later date given, entitled "Mysteries or Moralities." The town stands 100 feet above the sea-level, and contains several fine buildings, while the country round is well-wooded. It has a considerable trade, and is rich in old associations.

Cupellation, a process by which gold or silver is extracted from lead containing small quantities of the more precious metal. The process depends on (1) the ready formation of lead (litharge), silver, or gold, being not oxidised when heated, and (2) the power which bone ash has of absorbing molten litharge. In assaying, the argentiferous lead is simply heated strongly on a bone-ash *cupel*, the oxidised lead being absorbed, and a small bead of silver remains. For manufacturing purposes the process is aided by a strong blast of hot air directed on to the molten metals, which assists in the oxidation of the lead, and also blows the litharge formed from off the surface of the metal, the last portions only being absorbed by the cupel.

Cupid (in Latin *Amor* or *Cupido*, and in Greek *Eros*), according to the more ancient Greek mythology the god of love, in the sense of a power uniting discordant elements into a harmonious whole. At a later date, as the god of sensual passion, he was reputed to be the son of Aphrodite or Venus, and was usually depicted carrying a bow and quiver. He was specially worshipped at Sparta, Samos, Athens, and Parion. Numerous statues were erected in his honour, the most famous of which was that by Praxiteles at Thespiæ.

Cupola (through Ital. fr. Lat. *cupa*, tub, cask), originally a semi-spherical dome, such as that of the Pantheon at Rome, or the temple of Vesta at Tivoli; and later and more generally a modified form, generally a semi-ellipse. More loosely the name is applied to any rounded top; in naval architecture to the revolving gun-turret on some kinds of ironclad; and it is used in conchology to denote the bulge of a shell.

Cupping, a method of medical practice which was formerly held in great esteem, but is now much less frequently employed. The theory of cupping consists in this—that by drawing blood to the surface, inflammation and congestion of underlying deep-seated organs may be relieved. Cupping is, for example, still employed in *nephritis*, or inflammation of the kidneys, the cupping glasses being applied over the lumbar regions. In former days recourse was so commonly made to cupping that professional cuppers found it a simple matter to earn a livelihood by the practice of their art. Cupping glasses are receptacles of four to six ounce capacity; a little spirits of wine can be burned expanding the air contained in the glass, which latter is then clapped upon the skin. The rarefied air condenses, a partial vacuum is produced, and the result is the production of swelling in the skin confined beneath the edges of the glass. This is the process of dry cupping. In wet cupping, after producing the local congestion, it is the practice to incise the skin with a lancet or "scarificator," and to encourage the flow of blood, if necessary, by further cupping. Wet cupping is now practically a thing of the past.

Cupressocrinidæ, a family of Crinoidea (q.v.) especially characteristic of the Devonian rocks. The most striking feature in the anatomy of the members of this group is the presence of five flat "consolidating plates" in the calyx. The true nature of these structures has been much discussed.

Cupule, the more or less cup-like structure surrounding one or more fruits in many trees, especially those forming the order *Cupuliferæ*, such as the oak, beech, Spanish chestnut, and hazel. It is formed after fertilisation, as a ring-shaped outgrowth from the peduncle. The cup of the acorn bears imbricate leaf-scales; the husk of the chestnut spinous rudimentary branches. This latter and that of the beech split downwards into four teeth as the enclosed fruits enlarge in ripening.

Cur, a loose popular name for a mongrel dog, often confined to such as are of small size.

Cura, CIUDAD DE, a town in Venezuela, South America, capital of the state of Guzman Blanco, 60 miles S.W. of Caracas.

Curaçao or CURAÇOA, a Dutch island in the Caribbean Sea, on the coast of Venezuela, with an area of about 212 square miles, was captured from the Spaniards by the Dutch in 1624, and surrendered by them to Britain in 1800. Restored in 1802, it was captured by the British in 1807, but again restored to Holland in 1814. Its chief productions are salt, figs, tobacco, maize, lemons, and oranges. From its oranges the famous Curaçao liqueur is manufactured. Its capital is Willemstadt on the bay of St. Anna.

Curara (CURARI, URARI, WOURARA, WOURALI) is a very poisonous substance, which is used by certain tribes of South American Indians for the purpose of tipping their arrows, etc. It is obtained from a mixture of plants, one of which is always some variety of *Strychnos*. It comes to Europe as a brown nearly solid extract with a very bitter taste. An alkaloidal substance, *curarine*, has been obtained from it, the composition of which is not yet definitely settled; as also an alkaloid *curine*, which yields very poisonous derivatives, although it is itself innocuous. If injected into the blood it causes insensibility to pain, and is sometimes so employed in physiological research. It has been used in medicine in cases of hydrophobia, epilepsy, and lock-jaw, but is not much employed.

Curassow, any bird of the arboreal gallinaceous genus Crax, from the forests of the Neotropical region. There are eight species, rather smaller than turkeys, with black or sombre plumage, curly crest, and a fleshy knob on the bill. There are fourteen tail-feathers, spread out and inclined. The Hocco (*C. alector*) is the Royal Pheasant of the Mexicans. These birds usually go in couples or small companies, and feed on worms, seeds, and fruit. They are unsuspicious and easily tamed.

"but the natives have found the turkey more profitable, or discovered that the Hocco does not multiply easily in confinement." The rare Mountain Curassow (*Oreophasis derbianus*), from Guatemala, belongs to the same family. [GUAN.]

Curate, strictly one that has a cure of souls, and the word is so used in the Church liturgy and rubrics. But it is generally now confined to a clergyman who has no benefice, and whose tenure of his office depends upon the will of his rector or vicar, and bishop. The status and the lot of the ordinary curate form one of the most perplexing questions of ecclesiastical organisation. A perpetual curate was one who was employed to fulfil the spiritual functions of a benefice whose emoluments were in the hands of a layman. Recent legislation has almost led to the disuse of the term perpetual curate.

Curb (fr. French *courber*. and Lat. *curvus*), that which is bent, or that which bends, turns, restrains or limits. In driving or riding the curb is a chain passing from the cheek-pieces of a horse's bit beneath his lower jaw, and capable of bringing a powerful leverage to bear upon the jaw. The curb of a well is the stone casing which prevents its falling in, and the curb of a street is the edging that demarcates the street from the pavement. The word is largely used in metaphor.

Curé, the principal priest or incumbent of a parish in France and French-speaking countries. The French *vicaire* corresponds to our *curate*.

Cureton, WILLIAM (1808–1864), a great Syriac schoiar, born at Westbury in Shropshire, was educated at Newport grammar school and at Christ Church, Oxford, of which house he was a chaplain. He was appointed assistant-librarian at the Bodleian, and in 1834 he became assistant-keeper of MSS. at the British Museum. In 1849 he was appointed Canon of Westminster and rector of St. Margaret's church. Among his services to literature was the elucidation of some epistles from St. Ignatius to St. Polycarp and others, discovered at Nitria. These he published with notes and a translation, and their appearance involved him in much controversy. He also discovered the remains of a recension of the four Gospels, and made many other contributions to Oriental scholarship.

Curfew (Fr. *couvre feu*), a bell which in ancient times in England rang at a certain hour in the evening to warn people to put out their fires. The practice is sometimes thought to have been a creation of Norman tyranny, but probably existed long before, and had for its simple object the putting out of fires. The curfew is still rung in some parts of England, and is sometimes a signal for apprentices to stop work. The usual hour for the curfew bell is sunset or eight o'clock, though Shakspeare, in *Romeo and Juliet*, says, "The curfew bell has rung, 'Tis three o'clock." This, however, may be a misreading of eight. "The curfew tolls the knell of parting day," says Gray's elegy. The word also denoted an ornamented cover for the fire.

Curico, a Chilian province having a capital of the same name, which is near the river Lontuë, and about 140 miles S.E. of Valparaiso. Population of capital over 10,000.

Curlew, any bird of the wading genus Numenius, with sixteen species, some of which are found all over the world. The Common Curlew (*N. arquatus*) is a native of Britain; the body is about as large as that of a chicken; the legs and bill very long, the latter strongly curved; and the total length of the bird is about twenty-seven inches. The plumage is ash-coloured, spotted with shades of brown. Curlews are shore birds in winter, passing the warmer part of the year on high moorlands. They feed on molluscs, worms, and insects, and are esteemed for the table. The nest is a rude structure of dry leaves, and the eggs, usually four, are olive-green, with dark blotches. The Whimbrel (*N. phæopus*) closely resembles the common species, but is somewhat smaller.

Curling, a Scottish national game of great popularity played upon the ice. A rink of about 42 yards is marked upon the ice, and at each end there is a goal called a *tee*, with a circle of 17 feet in diameter inside of which any ball must be to count. Each player has a pair of curling-stones which vary from 35 to 50 lbs. in weight, and from 30 to 36 ins. in diameter, with a height of 4 or $4\frac{1}{2}$ inches, and fitted at the top with a curved handle for propulsion. The players may consist of any even number, and the object of each is to get his own ball as near as possible to the tee, to drive out an enemy's, or help on a friend's. At a certain distance from each end of the rink is marked a line called the hog score, and any ball falling short of this is out of play. The game is carried on also in the Scottish colonies of Canada. One of Hawley Smart's novels, *Sunshine and Shade*, has a lively description of the curling under the auspices of a Gallicised Highlander who wears the kilt, keeps up all old Scottish customs, but speaks French only.

Curll, EDMUND (1675–1747), a somewhat notorious London bookseller. A quarrel with Pope caused his insertion in the *Dunciad*. He busied himself with the publication of indecent literature, and once he was tried and convicted for publication of obscene books, and twice he appeared before the Lords for publishing matter concerning them. With reference to some biographies which he produced he was said by Arbuthnot to have added a new terror to death, a remark that has been credited to Lord Brougham with reference to Campbell's *Lives of the Judges and the Chancellors*.

Curran, JOHN PHILPOT (1750–1817), was born in Cork, and by his talent attracted the attention of a clergyman, who forwarded his education and was the means of his entry at Trinity College, Dublin. Curran himself tells us how, when a successful barrister, he came home and found the clergyman sitting by his fire, and of the somewhat theatrical reception he gave his benefactor. From Dublin Curran came to London, and figured largely at debating societies, where his Irish eloquence produced a great effect. He married, and in 1775 was

called to the bar. His early nervousness was cured by an insult from the presiding judge at a trial in which he was concerned, and very soon his success in cases and his readiness to back his opinions in a duel made him a popular advocate. In 1782 he became a King's Counsel, and next year entered Parliament. He was greatly opposed to the Act of Union, and at first thought of abandoning his career and going to America. However, he changed his mind upon this point. He won great renown in several State trials, and made a very effective speech in a celebrated elopement case. His later years were not without clouds, for his wife eloped, and his daughter—who was attached to the rebel Emmet—died of a broken heart, and he himself was suspected of complicity in the rebellion. In 1806 he was made Privy Councillor and Master of the Rolls, a post which he held for eight years. He then retired, and spent his remaining years in London, where he enjoyed the companionship of Sheridan, Moore, Erskine, and Godwin.

Currant, the sun-dried fruit of a small-fruited variety of the grape (*Vitis vinifera*, var. *corinthiaca*), grown chiefly in Greece and the Ionian Isles, where it seldom forms any seed. It takes its name from Corinth; but the kinds now distinguished in commerce are Vostitza, Patras, Gulf, Cephalonia, and Zante. The entire crop in 1888 was 160,000 tons; that in 1890, 145,000 tons, whilst Britain's imports rose in the latter year to 57,000 tons, a great increase on previous amounts, owing to the reduction of the customs duty to 2s. per cwt. The name currant has been extended to the totally different fruits of *Ribes nigrum* and *R. rubrum*, small shrubs native to Britain and northern temperate or sub-arctic regions generally, and belonging to a small order related to the saxifrages. They bear pendulous racemes of greenish perigynous flowers, and the fruit is a true berry surmounted by the withered calyx. Garden varieties of *R. rubrum*, the red currant, bear white or pale amber fruit. Both red and black currants are used for tarts, jams, jellies, and wines; black currant being also valuable as a gargle or in lozenges for sore throat.

Currant Wine, once much made in English households, but not now generally to be found. The fruit is boiled with sugar, set aside to ferment, and then bottled, and should be kept for some time before drinking. Other substances sometimes are added to improve the flavour.

Current. 1. In *Electricity*, current is the term used to denote motion of electric quantity, the magnitude of current at any instant being measured by the rate at which displacement of electricity takes place. It is generally understood that the motion does not take place in one direction only, there being apparently displacements in opposite directions at the same time, in the same sort of way that waves may meet and pass each other on the surface of a liquid. Any such fluid analogies must, however, be employed with caution in the case of electricity. For a current to flow from one point to another a conductor must exist continuously between the two points, and a difference of pressure of the electricity, or, as it is termed, a *difference of potential*, must likewise exist between them. So, in hydraulics, a conducting channel must exist for a current of water to pass from one point to another, between which in the same way a difference of pressure must exist. The magnitude of the electric current will necessarily depend on the conducting power or *conductance* of the medium between the points, and also on the difference of potential between them. The ordinary unit of current is the *ampère*, which is the intensity of the current when the unit quantity of one *coulomb* is displaced across any section of the conductor per second. It is also the current which flows through one *ohm* resistance, when its two ends are at one *volt* difference of potential. With a steady current the quantity displaced across any section of an electric circuit must be the same. Instruments for measuring current intensity are called ampère-meters, or *ammeters*. Of these there are many types in commercial use. They should be sensitive, that is to say, they should give obvious readings for small currents; they should be dead-beat, that is, recording the steady reading at once without wasting time in oscillations of the pointer or needle; they should be unaffected by neighbouring magnets or electric circuits and should be portable, direct-reading, and cheap. All these qualifications are not possessed by any single instrument, but circumstances may permit one or more of the conditions to be neglected. [Electricity.] Currents are either continuous or alternating. In the former the displacements are always in the same direction, whereas in the latter the displacements periodically change their direction. Thus, in an alternating-current circuit the magnitude of displacement in any one direction in a given time is zero. Nevertheless, alternating currents have many industrial applications.

2. Current, in *Hydraulics*, signifies the flow of water or other liquid from place to place. The current in any channel may be measured by the quantity of water flowing past any section per second. This quantity will depend upon the area of this section, and upon the average speed of flow at right angles to the section. To measure the current we may in the case of small channels erect a triangular or rectangular or *gauge-notch*, through which the water shall flow. Observations of the upper level of the water and of the dimensions of the notch afford a means of calculating the quantity flowing through per second. If the stream be large, the exact shape and dimensions of a suitable section of the stream are obtained by soundings, and the speed or flow at various points in the section determined by specially designed current meters. These data, if sufficiently numerous, enable us to calculate the current.

Currents, Ocean, movements of the surface-waters of the ocean in a constant direction under the influence mainly of the constant or trade-winds (q.v.). Thus, currents from the north-east and south-east unite in equatorial latitudes into one westerly current. This is deflected to the north and south by the intervention of continental land-masses, and

the resulting currents may also be influenced by the earth's rotation and by the anti-trade winds. These causes seem, in fact, to tend to produce an easterly current in temperate latitudes. Thus, in the Atlantic a current from between the Azores and Portugal towards Cape Verd, known as the *African current*, unites with one from the Cape of Good Hope to the Gulf of Guinea, the *South African current*, to form an *Equatorial current*. The south-east trade-wind, being stronger than the north-east, deflects the greater part of this current north-westward from Cape St. Roque into the Caribbean Sea and the Gulf of Mexico, whence it issues as the *Gulf Stream*, whilst the smaller part turns southwards to the mouth of the La Plata as the *Brazil current*. The Gulf Stream flows through the Florida Strait at a rate of between four and five miles an hour, with a surface temperature reaching 80° F. It flows parallel to the coast of the United States, but is separated therefrom by a cold prolongation of the Labrador current from Baffin's Bay until it is lost about the latitude of the Azores. In the comparatively still water between it and the North Equatorial current is the mass of floating seaweed known as the *Sargasso Sea*. The Brazil current flowing eastwards from the La Plata towards the Cape of Good Hope is mainly absorbed in the northerly South African current, but in part flows eastward towards the Crozet Islands. Similarly, in the Pacific, the *Pacific current* from Alaska down the coast to Mexico, and the *Peruvian current* from Patagonia up the coast to Ecuador, cross the ocean as parallel equatorial currents mainly to the north of the equator. The northern one is mainly deflected northward and north-eastward as the *Japan current* or Kuro Siwo to the Aleutian Isles, whilst no defined cold current meets it from the narrow and shallow Behring Strait. The South Equatorial finds its way in part through Torres and Sunda Straits into the Indian Ocean, the remainder being deflected from Fiji towards Brisbane, whence it flows back eastward to the north of New Zealand and toward Cape Horn. In the Indian Ocean a single equatorial current flows from the Sunda Islands to the Mascarenes, whence part of it circles round past Socotra into the Arabian Sea, whilst two other parts flow down each side of Madagascar, unite, and off Cape Agulhas are abruptly deflected eastward towards St. Paul, and so on to Tasmania and the South Pacific. These currents are seldom more than 500 feet deep.

Besides these currents due mainly to wind, there seems good evidence of a slow general circulation of all the water of the ocean, due to convection currents. [OCEAN.]

Curry Powder (from Hind. *kari*, an Indian dish) is a powder which is much used in India and Ceylon, and by Anglo-Indians in this country, and in cooking generally, as a condiment to season different dishes into which rice generally enters largely. There are at least forty methods of preparing a curry, and many ingredients, and those in varying proportions, enter into its composition. Among such substances are anise, allspice, almonds, coriander seed, cinnamon, mustard, ginger, cloves, poppy-seeds, cayenne pepper, salt, onions, garlic, turmeric, and scraped cocoanut.

Cursing. Swearing and cursing are offences against God and religion. By an Act of Parliament passed in the nineteenth year of the reign of George II., which repealed all former statutes on this subject, every labourer, sailor, or soldier profanely cursing or swearing shall forfeit 1s., every other person under the degree of a gentleman 2s., and every gentleman or person of superior rank 5s., applicable to the poor of the parish wherein such offence is committed; and on a second conviction shall forfeit double, and for every subsequent offence treble the sum first forfeited, with all charges of conviction, and (in default of payment) shall be sent to the house of correction for ten days. Any justice of the peace may convict upon his own hearing or the testimony of one witness; and any constable or peace officer, upon his own hearing, may secure the offender and carry him before a justice, and there convict him; but the conviction must be within eight days after the commission of the offence; and if either omits his duty, the justice forfeits £5 and the constable 40s. There is also a penalty of 40s. imposed by the "Town Police Clauses Act, 1847," and "Metropolitan Police Act," for profane language in the streets. Cursing, or wishing ill to the Sovereign, or doing anything to lessen him in the esteem of his subjects, or to weaken his government, is also an offence punishable by fine and imprisonment, and also corporal punishment. [BLASPHEMY.]

Cursorial Birds, a translation of the Latin *Cursores*, the single Order of Ratite Birds, containing the ostrich, rhea, emu, cassowary, and apteryx, and the extinct gigantic wingless birds of Australia, New Zealand, and Madagascar. [BIRDS.]

Curtesy, TENANT BY. Tenancy by the curtesy of England is the right and title which the husband possesses to enjoy for his life, after his wife's decease, lands of his wife of which she and her husband were seized in the wife's right for an estate of inheritance during her life, and where issue of the marriage is born which by possibility may inherit. By the special custom of gavelkind, a man may be such tenant by the curtesy without having had issue by his wife; but in this case he has only an interest in one-half of the lands, and he loses that if he marries again. There is no tenancy by the curtesy of copyhold lands, except by special custom, but the customs of copyhold manors vary considerably.

Curtis, GEORGE WILLIAM (b. 1824), an American writer, who in 1850 joined the staff of the *New York Tribune*. From 1852 to 1869 he was joint editor of *Putnam's Monthly Magazine*, in 1853 took part in editing *Harper's Monthly*, and in 1857 of *Harper's Weekly*. In these magazines he published some novels, among them *Trumps* in 1862.

Curtis, SIR ROGER, British naval officer, was born in 1746, and became a lieutenant in 1771, a commander in 1776, and a captain in 1777. He rendered most valuable service during the defence

of Gibraltar in 1782, when he commanded the gunboats, and received a knighthood as a reward. Upon the outbreak of the French war he was made captain of the fleet to Lord Howe, and as such, although by that time a rear-admiral, was present at the victory of "the Glorious First of June," 1794. For this service he was made a baronet. He was afterwards commander-in-chief at the Cape of Good Hope, and at Portsmouth, and he died in 1816.

Curtius, Ernst, a German archæologist and historian, born at Lubeck (1814). He was educated at Bonn and other universities, and afterwards visited Athens and travelled much in Greece. For a time he taught in Berlin, and from 1844 to 1849 he was the tutor of the Crown Prince of Prussia (afterwards Emperor Frederick), whom he accompanied to Bonn. He was afterwards professor at Göttingen and Berlin. He did much exploration in Asia Minor. Of his works the best known in England is his history of Greece, which was translated by A. W. Ward. The opening chapter, which shows how from a geographical point of view Western Asia Minor is distinct from the Eastern part and forms a natural part of Greece, is very interesting. Besides many other works in his special subject, he collaborated in the production of an *Atlas von Athen*, and also in *Ausgrabungen zu Olympia*. On the 22nd of December, 1891, the jubilee of his 50th year of doctorate was celebrated, and he received many congratulations from the Emperor William and other friends and admirers.

Curtius, Georg (1820–1885), brother of Ernst, was born at Lubeck. After studying at Bonn and Berlin, he taught at Dresden and Berlin, and was professor of Classical Philology at Prague, Kiel, and Berlin. He contributed largely to philological literature, especially to that dealing with the Greek language, and many of his works have been translated into English. He was a great exponent of the doctrine of sporadic change in phonetic development, a doctrine at variance with that of preceding philologists, and one that has since been questioned by some of his disciples. [Philology.]

Curtius, Mettus or Mettius, according to one tradition, was a Sabine general who rode into a marsh to avoid the Roman troops. Another story represents him as a Roman patrician who sacrificed himself for the good of his country. In 362, the story goes, a thunderbolt fell into the Forum, and caused a chasm. The soothsayers declared that it could only be closed by sacrificing what was dearest to Rome. Curtius said that her citizens were Rome's dearest possession, and then mounted and fully armed he sprang into the gulf, which closed over him.

Curtius, Quintus Rufus, a Roman writer of uncertain date, who has been described as belonging to one or other period ranging from the Augustan age to the Middle Ages. He wrote a biography of Alexander the Great in ten books, of which two are lost, and the remaining eight are incomplete. It is sometimes used as a school textbook, though perhaps rarely in England.

Curule Chair, the chair of state of the old Roman kings, and later of certain chief officers of state. Under the emperors the use of these chairs was confined to the emperor and the priests of his family, and possibly to the prefect of the city.

Curve, in *Geometry*, means any line that is not straight. Any line, whether straight or curved, may be understood to be a succession of points ranged at an infinitely small distance from each other. Two consecutive points on the curve determine its direction; the change in direction as we proceed along the curve is called the *curvature*. The curvature is great if the change in direction is rapid, as in the case of a circle of small radius. The curvature is slight if the rate of change of direction is slow, as in the case of a circle of large radius, or of a line nearly straight. A straight line has no curvature, *i.e.* the radius of curvature is of infinite length. The line joining two consecutive points is known as the tangent to the curve. Three consecutive points determine two consecutive tangents, and therefore determine the curvature or rate of change of direction; through these three points a circle may be drawn, which is called the *circle of curvature*.

The reciprocal of the radius of this circle measures the curvature. A curve might also be regarded as the envelope of a series of lines, all of which are tangents to the curve. From these principles curves may be classified. Thus, curves of the *second degree* can be cut by any plane in two points only; curves of the *second order* can have only two tangents drawn to them from any point. Examples of such curves are the ordinary conic-sections, the circle, ellipse, parabola, hyperbola, line-pair, etc. Curves of higher degree can be cut in more points than two; curves of higher order can have more than two tangents from any one point, as, for example, the cycloid, the cissoid, the conchoid, etc. A curve that is not confined to one plane is said to be *tortuous*, such as the screw, or spiral. The more important curves are noticed separately.

The curvature of any surface is determined by that of any two sections of the surface at right angles to each other. It is constant in the case of a sphere. If the centre of curvature is on the side exterior to the surface, this is called *concave;* if interior, the surface is *convex*. Hence the terms concave and convex as applied to mirrors and lenses.

Curwen, John (1816–1880), an English musician, born at Heckmondwike in Yorkshire. His father was an independent minister, and the son was appointed to a pastorate at Plaistow. In 1841 he inaugurated the Tonic Sol-Fa system in music. In 1843 he published a *Grammar of Vocal Music*, and in 1864 gave himself up entirely to the advancement of his musical views.

Curzola (formerly *Corcyra*, called "Black" to distinguish it from its more famous namesake), an island of the Adriatic, forming part of the province of Dalmatia, and having a length of 25 miles and an average width of 4 miles. Originally Phœnician, it was afterwards colonised by Greeks from Cnidus. The town Curzola has a cathedral, a palace of the old Venetian government, and much fifteenth-century

architecture. It is famed for boat-building. The population of the island is about 12,000, that of the town about 2,000.

Cuscuta. [DODDER.]

Cushat, a provincial name for the Woodpigeon (q.v.).

Cushing, CALEB (1800–1879), an American statesman, born at Salisbury in Massachusetts. He was called to the bar in 1821, and was a member of Congress from 1834 to 1843. In 1844 he negotiated the treaty between the United States and China, and, after commanding a regiment in the Mexican war, he was appointed U.S. attorney-general in 1853, retaining the post till 1857. He was U.S. counsel at the Geneva Conference in 1872, and was ambassador to Spain from 1874 to 1877.

Cushman, CHARLOTTE SAUNDERS (1816–1876), an American actress, born at Boston. She appeared in opera in 1834, and the next year she played Lady Macbeth. In 1844 she played in different parts of the States with Macready, and afterwards came to London. She played in high comedy and tragedy, among her characters being Lady Macbeth, Rosalind, Romeo (to her sister's Juliet), and Meg Merrilies. She retired in 1875.

Cusk. [TORSK.]

Cusp (Lat. *cuspis*, point of spear, etc.) denotes in astronomy the horn of a crescent, as for instance of the moon; in astrology the entrance of a house in the calculation of a nativity; in geometry, a point of a curve where the curve turns and goes in a reverse direction; and in architecture, the intersection of small arcs, and the figures resulting therefrom. The term is also used in anatomy, botany, and zoology.

Cusso, the inflorescence of *Brayera anthelmintera*; it contains a bitter resin, and is used medicinally as a vermifuge.

Cust, ROBERT NEEDHAM, an English writer and Indian official, born in Bedfordshire, and educated at Eton. He entered the Indian Civil Service, and, after occupying different posts in North India, became a member of the Legislative Council. He returned to England in 1869, and was elected member of several learned societies. He has written works on the languages of the East Indies, Africa, and Oceania, besides essays and sketches of Anglo-Indian life.

Custard (Fr. *croustade*, It. *crustata*, Lat. *crustatus*, from *crusta*, a pie or tart), strictly anything with a crust, but now denoting a kind of semi-liquid or quite liquid pudding made of eggs and milk, sweetened, spiced, flavoured, and boiled or baked.

Custard Apple, the fruit of various species of *Anona*, the genus of trees which gives its name to the order *Anonaceæ*, allied to the *Magnoliaceæ*. They are mostly natives of tropical America, though extensively cultivated throughout the tropics. In British India this name is applied to *A. squamosa*, which is also known as sweet sop or sugar apple. In America *A. muricata*, the sour sop, and in the West Indies *A. reticulata*, the bullock's heart of India, is called custard apple. The trees are small, with scattered exstipulate leaves and a ternary perianth, having three sepals, six petals, indefinite stamens, and indefinite carpels. The latter become fused together into a large, many-chambered, fleshy, and juicy fruit, oval or rounded in form, and sometimes weighing several pounds. The fruit is more appreciated by natives than by Europeans.

Custom, a law not written but established by long custom by consent of the people. Customs are either general or particular. *General* customs are the universal rule of the whole kingdom (*e.g.* primogeniture) and form the common law in its stricter and more usual signification. *Particular* customs are those which mostly affect particular districts, as gavelkind in Kent. The courts are bound to take notice of general customs, but particular customs must be both pleaded and proved before they are judicially allowed. Moreover, a general custom is always good, but a particular custom in order to be good must be *reasonable*, *certain*, *compulsory*, *immemorial*, and *possible* in law. [COMMON LAW.]

Customs. Of old certain dues claimed for the Crown as of ancient right and custom. Then the word denoted any fixed toll, tax, or duty. The Prayer Book speaks of "accustomed dues." It is now generally restricted to the duties levied upon exports and imports. The adjustment of customs forms an important point in national finance, and in international relations. [FREE TRADE.]

Custos Rotulorum, the chief civil officer of the county to whose custody are committed the records or rolls of the sessions. He is always a justice of the peace and quorum in the county for which he is appointed. The lord-lieutenant has the chief military command of the county, and his office is quite distinct from that of custos rotulorum, but it is a usual practice to appoint the same person to both offices, in whom are united the highest military and civil authority in the county.

Custozza, an Italian village, 10 miles S.W. of Verona, notable as being the scene of two Italian defeats at the hands of the Austrians. Radetzky defeated Charles Albert in 1848, and in 1866 Victor Emanuel was defeated by the Archduke Albert.

Cutch, a native state of India, but under British protection, and situate in the Bombay government. It lies between long. 68° and 72° E., and lat. 22° and 25° N., and is bounded on the W. by an eastern branch of the Indus, on the S. by the Indian Ocean and the Gulf of Cutch, and on the N. and E. by the Runn of Cutch, which is a salt-water morass, hard and baked during the dry season, but forms a shallow lake during the monsoons. The interior abounds in hills, and from east to west runs an irregular mountain range, which is intersected with valleys which are sometimes fertile, but generally wild and barren and covered with jungle, and among them many petty chiefs have strongholds, from which they issue upon raiding expeditions similar to those which

formerly took place upon the Scottish border or in the Highlands. The country is liable to earthquakes, and as the rains are uncertain there is often famine. The water supply is scanty in quantity and bad in quality. Grain, cotton, and tobacco are the most important productions, and coal and iron are found, but not much used. The Runn of Cutch contains 8,000 square miles, and varies in width from 5 to 80 miles. The wild ass abounds in the neighbourhood. In the hot season the temperature is from 100° to 105°, and in the wet season there is much marsh fever, while in April and May violent sand and dust storms prevail. The capital is Bhuj, which is inland and surrounded by hills, and the chief seaports are Mandava and Mundra. There are many streams, but few remarkable rivers. The natives are rather a handsome race, and are much addicted to opium.

Cuthbert, St. (635–687), was born in Northumbria and educated at the ancient monastery of Melrose. The first Abbot of Melrose, Eata, came to Ripon and Cuthbert accompanied him. A difference with the English ecclesiastics as to the time of keeping Easter caused both to return to Melrose, where Cuthbert became prior. Eata was afterwards summoned to Lindisfarne and again Cuthbert went with him as prior. But Cuthbert longed for solitude and retired to Farne Island, whence he was summoned in 685 to the bishopric of Lindisfarne. In 687 he again retired to Farne, where he died. When the Danes made their inroads St. Cuthbert's relics were removed and finally lodged in Durham cathedral. He was to the north what St. Thomas of Canterbury was to the south, and his banner—said to have been used by him as an altar cloth—was thought to bring victory. It was carried at the battle of Neville's Cross and at Flodden Field, its last appearance being in the Pilgrimage of Grace. A life of the saint by the Venerable Bede describes him as travelling about the country under his charge preaching and teaching his people.

Cuticle, in the higher plants, is a continuous membrane extending over the whole epidermis, and consisting of a derivative of cellulose (q.v.) known as *cutin*, which becomes yellow on treatment with chlor-zinc-iodine (Schulze's solution). The cuticle originates from the outer or primary walls of the epidermal cells, the secondary thickening layers next beneath it being partly unaltered cellulose and staining darker, whilst the innermost and youngest layers are all cellulose and stain blue. This cuticle can be separated as a distinct membrane, but does not extend over hairs, and only a little way down into the entrance of the stomata. It often secretes wax, which may exude from it so as to form a *glaucous* or blue-grey "bloom." In most characters cuticle agrees with cork (q.v.).

Cutlery (Fr. *coutellerie*), strictly the generic name of cutting instruments, but chiefly used in England for the finer kinds of such, larger kinds coming under the head of tools. Although a fork is not an edged tool, it generally comes under the head of cutlery, possibly for the sake of convenience from its relation to a knife. The Sheffield whittle was known to Chaucer, but it was not till much later that Sheffield really earned the reputation for cutlery which it now enjoys. The spring-back pocket knife seems to have been introduced early in the seventeenth century. Naturally swords were perfected at an early period in the history of cutlery. Much interesting information upon the forging, grinding, and handling of blades may be found in Charles Reade's *Put Yourself in His Place*.

Cuttack, the capital of the central district of Orissa, Bengal, at the point of the Mahanuddy delta, and 220 miles S.W. of Calcutta. It is noted for its gold and silver filigree work. The population of the district, which contains 3,157 square miles, is about $4\frac{1}{2}$ millions.

Cutter, a small vessel with one mast and a straight running bowsprit. As now built, a cutter is rigged exclusively fore-and-aft, though at the beginning of the century she had a square topsail. The rig is particularly suitable for yachts, and is also much favoured by pilot boats.

Cut-throat Finch. [Coral Neck.]

Cuttlefish, the popular name of the Sepias or *Sepiidæ*. The term is, however, often used more generally to the whole of the two-gilled Cephalopods, including the squids, devilfish, spirula, and paper nautilus (*Argonauta*). The true "cuttles," however, belong to the sub-order "Decapoda," and the section Sepiophora. They may therefore be defined as Cephalopods provided with a pair of gills (or branchiæ) and an ink sac, a tubular funnel, a pair of tentacles in addition to the eight equal arms, and in which the skeleton is internal and calcareous, and has no phragmocone or only a rudimentary one. The shell or sepion, or "cuttle-bone," is the most characteristic feature. This consists of a flattish oval plate composed of numerous thin plates separated by small pillars; the whole is composed of carbonate of lime. At the lower end is a small sharp point known as the mucro; this is composed of very dense tissue, and it is hollowed out in front to receive a small chambered structure which is the rudimentary phragmocone. If the cuttle-bone be compared with a Belemniti (q.v.) the phragmocone may be seen in each, while the small mucro of the former represents the "guard," and the main mass of the sepion is equivalent to the delicate "proostracum." Owing to the thinness of the plates of which the cuttle-bone is composed, it is very brittle and easily rubs down into powder; it is therefore of much use as polishing material.

In regard to the structure of the soft parts, the cuttles do not vary much from the ordinary Dibranchiate Cephalopods. The body is generally rounded behind with a short blunt head bearing the ten arms; the mouth opens in the space between the bases of the arms. A fin runs all round the margin of the body. The skin or integument is generally of a light colour, but this varies

greatly by the expansion of the "chromatophores," small patches of pigment scattered all over the body. The arms are of two sizes; there are eight true arms, equal in size; these bear short suckers or "acetabula," by means of which the cuttlefish can firmly hold its prey; the remaining two arms are much longer, and are known as tentacles; they are concerned with the transmission of the male reproductive elements or "spermatophores" to the genital chamber of the female. The mouth is armed with a chitinous beak; the œsophagus is short and leads to a simple pyriform stomach at the hinder end of the body; the intestine is straight and opens to a "pallial chamber" on the ventral side of the animal; thence the excreta escapes through the funnel. The nephridia or kidneys and the ink sac also both open to the pallial chamber; the ink sac is a glandular organ which secretes a black-coloured pigment mixed with various mineral salts; by the ejection of a drop of this "sepia" the water is rendered so cloudy that the cuttle can effect its escape. The blood system consists of a large central heart from which the blood passes to two accessory or "branchial" hearts; these drive it to the gills, where it is aerated and returned to a pair of auricles and thus to the true heart. There are three main pairs of nerve ganglia; commissures from these form a collar round the œsophagus; the cerebral ganglia are enclosed in a cartilaginous capsule suggestive of a cranium.

The cuttle-fish are all marine; they live either crawling over the bottom of seas of limited depth or swim rapidly backward by the violent ejection of water from the pallial chamber through the funnel; they can swim gently forward by the movement of the lateral fin. The Sepias are now very widely distributed, though the number of genera and species is now somewhat limited. The oldest fossil forms occur in the Eocene system.

Cuvier, GEORGE, was born at Montbeliard, near Besançon, in 1769, and educated at the academy of Stuttgart. He became tutor in the family of the Comte d'Hericy, near Caen, in Normandy, where the Channel afforded him means of studying fish and mollusks. Here the Abbé Tessier discovered him and introduced him to the naturalists of Paris. He received in succession various professorial appointments, working with Lamarck and Geoffrey St. Hilaire, and astonishing his colleagues by the clearness of his lectures on comparative anatomy and his masterly use of the pencil. In 1796 Cuvier was one of the founders of the National Institute, of which in 1803 he was chosen a secretary. While issuing numerous separate anatomical memoirs on almost every group of the animal kingdom, Cuvier issued no separate work before 1812. In 1800 his pupil Dumeril issued two volumes of notes of his lectures as *Lessons on Comparative Anatomy*, which were supplemented by three others by Duvernoy in 1805. In 1812 appeared the first edition of the *Researches on the Fossil Bones of Quadrupeds*, a work based largely on the Eocene fossils from the gypsum beds of Montmartre, which may be said to have laid the foundations of vertebrate palæontology. In 1817 many scattered memoirs were collected as *Contributions to the History and Anatomy of Mollusks*, and in the same year appeared the first edition of his most popular work, *The Animal Kingdom*. This was in four volumes, and was all his own work except the insects, in which he was assisted by Latreille. It contains the details of his classification of animals into Vertebrata, Mollusca, Articulata, and Radiata. In 1825 appeared the *Discourse on the Changes of the Earth's Surface*, Cuvier's chief contribution to general geology, and between 1828 and 1831 his *Natural History of Fishes*, produced in conjunction with Valenciennes. Cuvier, who had been entrusted with many important duties in educational administration by Napoleon, retained his position under the Bourbons, and in 1831 was made a peer of France by Louis Philippe. In 1832 he died. Besides innumerable contributions to descriptive and comparative anatomy, Cuvier introduced three main principles:—First, that of "correlation of growth," by which he first demonstrated the possibility of "reconstructing" fossil animals from mere fragments; second, that classification must be based not on external or physiological but on anatomical characters; and third, the substitution of a natural classification of animals for the artificial system of Linnæus. He thus did for zoology what the Jussieus and De Candolle did for botanical science.

Cuyp, a Dutch family which produced two painters. 1. JACOB GERRITSE (1575–1649), generally called the Elder, was born at Dort. His chief works were portraits and groups and animal life. He was realistic in treatment and somewhat stiff. 2. ALBERT (1605–1691), son of the above, was also born at Dort, and was a thorough Netherlander in artistic taste. His landscapes are generally taken from the banks of the Meuse and Rhine, and he delighted in rivers and meadows with groups of horses and cattle, stables, men and women on horseback, barges, and the like, the steeples and towers of Dort being generally visible in the background. He was very successful with reflections in water, and there is a certain tinge in his pictures which has caused him to be described as "blond." He has also painted some imaginative subjects, *e.g. Orpheus and the Beasts.* His *Riders with Boys and Herdsman* is in the National Gallery, London. He has been described as delighting in summer, noon, and calm, rather than in winter, night, and storm.

Cuzco, a town of Southern Peru, 11,000 feet above the sea, and capital of a province of the same name, which has a population of 238,000. The town is 350 miles S.E. of Lima, and was the ancient capital of the Incas, whose fortress still exists on a hill to the north. Cuzco is at the head of a fertile valley, and has fine buildings, many of them being in the lower parts the work of the Incas. There is a good cathedral. Cotton, leather, linen, sugar, are among the productions, and there is good gold and silver work. A remarkable feature of the neighbourhood is the slight bridges which are carried over ravines. Of the population a great proportion are Indians.

Cyanates are compounds derived from *cyanic acid*, HCNO, by replacement of the hydrogen by some other element or group of elements. The *isocyanates* form a series of compounds of the same composition, but differing in constitution. [Isomerism.] Both classes of substances are of considerable chemical, though of little general, interest and importance.

Cyanic Acid. [Cyanates.]

Cyanides, a class of substances which may be regarded as derived from *hydrocyanic* or *prussic acid*, HCN, by the substitution of other elements, or "radicals," for the hydrogen. Of the metallic cyanides, potassium salt, KCN, is of great importance industrially, being largely employed in photography and electro-plating. It also finds constant application in metallurgical and chemical operations. The metallic cyanides are all poisonous, some being as strong as prussic acid itself. They are manufactured chiefly by heating carbon, nitrogenous matters, and a metallic, usually potassium, carbonate. Other methods are also employed in which the atmosphere is used as the source of the nitrogen. Cyanides may be detected by heating with yellow ammonium sulphide, and adding a ferric salt to a drop of the distillate, when a fine blood red coloration results. A large number of "double cyanides" exist—*i.e.* compounds in which two metals are present, as *e.g.* potassium ferrocyanide (prussiate of potash). The organic cyanides (ethyl cyanide, etc.) have the same composition as the *Carbamines* (q.v.), the difference in their substances being explained by the supposition that their constitution is as indicated by the formulæ:

XCN, cyanides; XNC, carbamines.

Cyanogen (Gk. *kuanos*, blue), CN, a gas which may be prepared by heating the cyanide of gold, silver, or mercury. It has a pungent smell, is poisonous, and burns with a purplish flame. It may be condensed by cold (21° C.), a pressure (21 atms.) to a colourless liquid of sp. gr. 0·866. It is soluble in water, but the solution soon decomposes. It is found, to a small extent, in blast furnace gases. In its chemical relations cyanogen shows many analogies to chlorine and the halogens. The single group, or "radical," CN, enters into the composition of many compounds, playing the part of an element, and the investigations of cyanogen and its derivatives, by Gay Lussac, formed one of the main foundations of the "radical theory" (q.v.).

Cyanophyceæ, or **Phycochromaceæ,** a group of Algæ, sometimes separated with the Schizomycetes under the name Schizophyta (q.v.), of a bluish or verdigris green colour from the admixture of phycocyan and chlorophyll. They are unicellular, or form chains of cells, or colonies embedded in mucilage; but no nucleus is known in the cells, nor any form of sexual propagation. They multiply by cell division, by resting cells, or by *hormogonia*, or motile portions of cell filaments. They live in fresh water, in damp places, or as endophytes in higher plants, such as Hepaticæ, Sphagnum, and Azolla. [Symbiosis.] They are divided into two groups—the *Chroococcaceæ*, including such forms as *Glæocapsa*, which are mostly in gelatinous colonies formed by the swelling up of parent cell-walls; and the *Nostocaceæ* (q.v.), in which the cells are united into filaments.

Cyanosis, blueness or lividity of the skin (Gk. *kuanos*, blue), is a symptom common to certain diseases of the heart and lungs, in which there is an interference with the due aëration of the blood. Cyanosis in a marked degree is a particularly characteristic symptom of congenital malformation of the heart.

Cyathocrinus, one of the best known genera of the Sea-lilies of the Palæozoic era. It is the type of the family *Cyathocrinidæ*, and it ranged from the Silurian to the Carboniferous periods. It belongs to the group "Inadunata," as the arms are quite free above the dorsal cup. The calyx was small, and the plates loosely attached; hence, they readily fell to pieces on the death of the animal. The stem was large, cylindrical, and composed of many thin ossicles, or joints. The genus was especially common in the Upper Silurian of the Wenlock district, from which locality the best English specimens are derived.

Cyathophyllum, one of the best known genera of the corals of the extinct group, the "Rugosa" (q.v.). It was common in the seas of the Silurian period, and survived till the Carboniferous. The corals of this genus are generally single, and of a curved and inverted conical form. Some species, however, were compound. The genus is the type of the family *Cyathophyllidæ*, which is of interest, as some recent corals may have to be included in it.

Cycads, an order of Gymnospermous plants in several respects closely related to ferns, which, though now only including some seven genera and about fifty species, played a leading part in the vegetation of Lower Secondary times. They have tap-roots; columnar, generally unbranched, stems, of no great height, with a large pith and broad medullary rays, and marked externally by leaf-scars; terminal crowns of large rigid pinnate circinate leaves, which, it has been suggested, however, may have some of the characters of branches; and diœcious flowers with elongated axes, closely resembling the sporangiferous "spikes" of some of the higher cryptogams. The male flowers consist of peltate sporophylls (stamens) in whorls, like those of *Equisetum*, bearing numerous microsporangia (pollen-sacs), the microspores (pollen-grains) in which are distinctly multicellular, having a group of "included cells," or male prothallium. The female sporophylls vary, those of *Cycas* being pinnate leaves with their lower lobes transformed into large ovules (macrosporangia), whilst those in other genera are peltate and bear only two ovules each. The seeds are albuminous, and the number of cotyledons varies. Most cycads form large quantities of starch in their pith, from which native substitutes for sago are prepared in Japan, the Moluccas, the West Indies, and South Africa. The genus *Encephalartos* gets its name of Caffre-bread from this fact. The "fossil

crows'-nests" of the quarrymen in the Isles of Portland and Purbeck are the stems of Cycadeæ.

Cyclamen, a small genus of *Primulaceæ* (q.v.), mostly natives of the Mediterranean region, but represented by one rare species, *C. hederæfolium*, in England. They have a large corm, which, though acrid, is eaten greedily by swine, whence the English name Sow-bread. The leaves are radical, petiolate,

CYCLAMEN (*Cyclamen hederæfolium*).

cordate, and often marbled with greyish-white, and the flowers form one-flowered scapes with curved peduncles. The lobes of the corolla are curiously reflexed and twisted, and after flowering the peduncle often bends down until the capsule is either on or in the ground. *C. persicum* and others are favourite greenhouse flowers.

Cycle (Gk. *kyklos*, circle), anything round, but generally used in some special sense of a recurring in motion or time, for instance, the orbit of a planet, or a period after which the order of days recurs. Sometimes it means simply an age or lengthened period as in Tennyson's phrase, "Cycle of Cathay." The word is used inphysics, in literature—to denote a set of tales or poems grouped around a certain event —and in botany. Among well-known cycles are the Chinese, Chaldean, Solar, and Paschal cycles. As a verb, *cycle* meant to circle round, and the word has been applied to denote progression upon a bicycle or a tricycle.

Cycling, a sport which bids fair to assume national importance in the British Isles. The bicycle in its various developments has enabled man by the use of his muscles alone to progress at greater speed, and with less fatigue, than has ever before been possible. The word bicycle is incorrect in formation, meaning two circles, and has been shortened to "cycle," whence the verb, "to cycle." The earlier progenitors of this modern machine were the various velocipedes, dating from the latter end of the 18th century, if not from the 17th, inasmuch as in 1691 John Greene took out on June 12th a patent for "new engines or carriages, driven or drawn by man or beast." In 1766 John Vevers, then head-master of the school "at Reigate in Surrey," invented "a travelling chaise to go without horses," the vehicle in question being a veritable four-wheeled coach, steered by a passenger and propelled by a footman, who operated levers from the rear. Very wisely the inventor added: "The velocity of these carriages depends on the activity of the managers." Most of these vehicles were termed, with unconscious sarcasm, "*self-moving* carriages." In 1779 an improvement or development of John Vevers' patent was produced by MM. Blanchard and Messurier, and exhibited in the courtyard of the palace of Versailles before Louis XVI. and Marie Antoinette. Many such vehicles were tried, but in almost every case the labour was to be done by a footman or attendant, who was in some cases called upon to propel a heavy carriage and seven passengers, in addition to his own weight. It was not until the beginning of the 19th century that the principle of balancing upon two wheels, one in front of the other, found practical development, and the earlier developments were, of course, extremely crude. The invention of what was known in later times as the Dandy Horse is usually credited to the Baron Drais de Saverbrun, Master of Woods and Forests to the Grand Duke of Baden, who was in 1818 resident at Mannheim-on-the-Rhine, and who there made and rode a vehicle known as the Draisnene, Draisienne, or Draisena. This was patented in France in the same year by Louis Joseph Dineur, on February 17, 1818. The Baron died in 1851. The Draisnene consisted of a bar of wood called "the perch" in England, carrying a pair of forks at each end, in which the two small wheels ran. The front pair of forks turned in a socket in the perch, and was guided by a handle which the rider grasped with both hands, a cushioned bar for the rider to lean his chest upon was provided in front of the saddle, and the rider progressed by striking his feet alternately on the ground on either side. A fair amount of speed could be attained on the level and, of course, down hill. The machine was done to death by the caricaturists, who never lost a chance of ridiculing the "pedestrian curricle."

The priority of Von Drais' invention has been questioned, as in 1816 Nicephore Niepce, of Paris, in collaboration with his brother, Claudelle Niepce, resident at Hammersmith, produced a machine on much the same lines as the Draisnene, called the celeripede. This was frequently ridden in the gardens of the Luxembourg, but may possibly have been copied from the Mannheim machine. In 1818 Dennis Johnson, a coach-maker, of Long Acre, London, introduced to the public his "Pedestrian Curricle," and this vehicle had a brief vogue, and was known as the "Hobby Horse" or "Dandy Horse." Important as were the principles involved, the "Dandy" failed to hold its own, though Dreuze in France mounted Government messengers upon them in 1830, whilst in 1836 Michael Faraday astonished the inhabitants of Hampstead by riding one, and the Duke of Northumberland and others used them. In or about the year 1840 a little group of riders of the Dandy Horse lived near Dumfries, and one of them conceived the idea of putting cranks upon the rear wheel, and connecting them with swinging bars, which could be put in motion by the feet. For the first crank-driven bicycle, the credit—hitherto given to Gavin Dalzell, a cooper of Lesmahagow, based mainly upon the survival of his original

machine, fitted as described, to the present day—is now claimed, on what appears to be very good evidence, for Kirkpatrick Macmillan, a blacksmith, of Keir, Dumfriesshire. Suffice it to say, that about 1840 the first crank bicycle was made and used. Although this machine was crank-driven, it was not propelled by direct crank action, and it was not until the Exhibition of 1862 that such a contrivance was shown, Messrs. Mehew, of Chelsea, showing a tricycle with two small wheels behind and a front steering-wheel, driven directly by pedals on the cranks, of exactly the same type as those to be seen at any time amongst the velocipedes for hire at the Crystal Palace and other places of public amusement. Messrs. Mehew, as far as can be ascertained, do not seem to have applied the idea to the bicycle, but on November 20, 1866, Pierre Lallement, a Frenchman, resident in England, patented a bicycle driven by pedal action direct on the cranks.

Up to this point little attention had been given to the bicycle. MM. Michaux et Cie., a Paris house, manufactured a number of velocipedes, but this vehicle was regarded merely as a *jouet d'enfant*, and as such was shown in the 1867 Exhibition. A Mr. Somers, seeing children riding these machines in Paris, took the trouble to learn to ride, and then brought the machine over to Charles Spencer's gymnasium, and soon enlisted the attention of a number of athletes. But velocipedes of the old type were constantly in use; some varieties had four wheels and were worked by both hands and feet, somewhat resembling bath-chairs propelled by the rider.

The sewing-machine trade in Coventry was then at a low ebb, and when Mr. Turner asked the manufacturing concern, since known as the Coventry Machinist Company, to build him some machines, the order was accepted, and the foundation laid of what is now the staple industry and most important trade in the city, which is, in effect, the home of cycle making.

In 1869 the word "bicycle" first appears in a patent office specification, the previous year having seen a "Show of Velocipedes" at the Crystal Palace—so often subsequently filled to overflowing with the thousands who visit the great annual "Stanley Shows." The development of the machine has gone on apace, and a thousand varying forms have been produced. For a long while the bicycle called, *par excellence*, the *Ordinary*, held its own; it was distinctly an expert's machine, required learning and mastering, but once this was accomplished, gave by far the best net results as regards comfort and ease. After keeping the lead for many seasons, it was challenged by the Dwarf, or so-called *Safety* bicycle, which ousted the tricycle, which had had a large measure of success from popular favour. The Safety, however, proved slower than the Ordinary in races, until the invention of the air tyre, which effected a radical change. In 1845 a Mr. Thompson invented and patented a tyre for wheels, filled with air under compression, and this principle was re-invented by a Mr. Dunlop, and applied to cycles. Like all inventions in their first stage, Mr. Dunlop's was distinctly crude, and the improvements effected, whilst they have reduced the tendency to burst on the part of the tyre, have slightly reduced its speed. Patented inflated tyres almost by the hundred are now upon the market, and the would-be user can have every grade, from the fast and less stable to the reliable and slow. The air tyre, applied only to the widely popular Safety, added some 150 yards per mile or more to its pace, and the Ordinary bicycle was of necessity left hopelessly in the rear, and even when fitted with the air tyre it did not prove a success. The adaptation of a mechanical action or gear to the hub of the Ordinary bicycle, however, bids fair to enable that type of machine to once again hold its own on road and path, the gear causing the driving wheel to revolve more frequently than the cranks. Inflated tyres, despite their immense advantages, such as the interception of vibration and pace, have, of course, many drawbacks, the principal of which are—the liabilities to puncture and burst, and the marked tendency to side slip—the most dangerous accident on Safety or Ordinary. Puncturing must be regarded as, on the whole, a necessary evil. A tyre to be fast must have thin walls possessing extreme flexibility; any contrivance designed to resist puncture will be found to seriously affect the speed of the tyre. Bursting is practically eliminated in all mechanically-fixed or gripped tyres, only those tyres fixed by solution or cement by means of exterior flaps being subject to it. Side slip is found in all tyres which are seated in abnormally shallow rims, and for road use a fairly deep rim in which the tyre is firmly seated is to be preferred.

Cycling has many economic uses apart altogether from its aspect as a mere pastime. The Carrier Cycle—the invention of Lacy Hillier—has been made by the great firm of Singer and Co. for the use of the Post Office, for many newspaper offices—these handy tricycles getting through traffic and up narrow ways where a cart and horse could not hope to penetrate—and for a large number of tradesmen throughout the kingdom. The adoption of the cycle for military purposes has met with unexpected success, and both in England and on the Continent the use of cycle-mounted infantry is rapidly extending.

Cycling is one of the best organised of our national sports. Its institutions include the National Cyclists' Union, presided over by the Right Hon. the Earl of Albemarle, K.C.M.G., himself a cyclist and joint author with G. L. Hillier of the *Cycling* volume of the Badminton Library. The "N.C.U.," as it is colloquially termed, rules cycling throughout England by means of "centres," promotes the Amateur Championships annually, and watches the interest of the sport on every hand. The Cyclists' Touring Club, known also by its initials, the "C.T.C.," has recently emerged from a period of internecine quarrels, and is once again prospering, and may in a short time be able to reassert its claims to be the largest athletic club in the world.

The sport owes much of its advancement and almost all improvements in the direction of lightening the machine to the publicity and experience gained by and on the racing path. Here the

machines, reduced to the lightest possible weights, are tested in the most thorough manner, and the light racer of to-day is the roadster of to-morrow. The best recorded times are constantly being altered, and any figures given might soon be obsolete. Suffice it to say that a quarter-mile has been ridden at a speed of 30 miles an hour, that one mile has been covered at a speed equal to nearly 27 miles an hour, and that that distance in two minutes and ten seconds appears well within the bounds of possibility, that $23\frac{3}{4}$ miles have actually been covered in 60 minutes, and that a distance of over 360 miles in 24 consecutive hours is lamented as inadequate and unworthy of the sterling athlete who accomplished it under disadvantageous atmospheric conditions.

The fastest track in Europe—probably in the world—is to be found in the grounds of the London County Cycling and Athletic Club, Limited, at Herne Hill. The oldest club is the Pickwick Bicycle Club, dating from June 22, 1870; no other club has had so long a continuous existence. The Stanley Cycling Club is one of the most active and energetic organisations, promoting each year the great Stanley Show. The most prominent Midland Club is the Speedwell Bicycling Club, and the most active purely racing organisation is the London County Cycling and Athletic Club, Limited.

The most important and influential paper in connection with cycling is *The Cyclist*, published in Coventry, the metropolis of the trade, and the sport supports a vast number of publications wholly, or in part, devoted to cycling. Cycling has obtained a firm hold upon the public, and is daily becoming more general. A large number of ladies ride cycles, many good schools exist for the proper teaching of the art, and those who are unable to attend such institutions can easily learn by following out carefully the instructions contained in any one of the many text-books published. The gist of the whole, however, may be crystallised into one sentence:—"Turn the steering wheel *towards* the side to which the machine is falling." Carry this out, and the cycle is mastered. Dress is a very important item, and needs careful attention. Here, again, the maxim is short and easily remembered:—"Wear nothing but wool." So garbed, the rider, however uncomfortable he may be, will not be in serious danger; the smallest patch of linen will strike cold and chill him. Special shoes are necessary, they should open a long way down, have a stiffened sole and be cut high over the front of the foot. Intelligently followed, cycling is a safe and healthy recreation, a convenient method of travelling, and an enjoyable and exhilarating pursuit.

Cycloid is the curve generated by a point on the circumference of a circle that rolls along a straight line. Its area is three times the area of the generating circle.

Cycloid Scales are scales not covered with enamel, and having a concentric striation and the front margin entire. When this margin is furnished with comb-like teeth the scales are called Ctenoid. [FISHES.]

Cyclone (Gk. *whirling*) is the name used to describe the general kind of storm which moves in a circle, or rather in a succession of intersecting spirals round a steadily advancing centre. The word is also used as synonymous with *hurricane* and *tornado*.

Cyclopes. 1. Mythological beings who worked with Vulcan in his Ætnean forges, and who probably were the volcanic agencies of the district personified. They were three in number, and were confined by Kronos beneath the earth. Zeus set them free to battle for him against the Titans, and gave them thunder and lightning. 2. An imaginary race, more in number than those last mentioned, who came from Lycia, and built Mycenæ and executed other colossal works, giving rise to the expression *Cyclopean walls*. 3. The Cyclopes of Homer, who were shepherds, and who were connected with the sea, Polyphemus, the antagonist of Ulysses, being the son of Neptune. A point of resemblance in them all was the one eye in the middle of the forehead.

Cyclops, the best known and most typical of that group of Crustacea known as the "Copepoda" (q.v.). *Cyclops* is very common in most English ponds and fresh waters, and may be readily recognised by its large single eye in the middle line towards the front of the head; its five pairs of two-branched swimming feet, usually provided with bristles; and the pair of large bottle-shaped ovisacs carried by the female. The form is also typical: it is cylindrical, bluntly rounded in front, and tapering gradually behind; the tail is two-lobed. Cyclops has a very rapid, darting movement. The species are fairly numerous, but are all small. *Cyclops quadricornis* is a representative species, and attains on an average a length of about a fifteenth of an inch.

Cyclostoma, a delicate univalve shell abundant in limestone districts in the South of England. It is of interest, as it is the only English land Gastropod (q.v.) which is provided with an "operculum," by means of which it closes the mouth of its shell. *Cyclostoma elegans* is the English species.

Cyclostomata (*round-mouths*). 1. A class of Vertebrates having no true jaws or limbs. Examples are the Hag-fish and the Lamprey, both which see. 2. A sub-order of Bryozoa (q.v.), in which the colony has a calcareous skeleton (zoarium) composed of long tubes. These open by a terminal orifice which is the same size as the tubes. They are the simplest of the three principal sub-orders of living Bryozoa, but are now less important than they once were. The English species only number a little over 30, though they were more abundant in the Chalk and Oolitic seas. The *Crisiidæ* and *Tubuliporidæ* are the two principal living English families, but representatives of them are rare in comparison with the Cheilostomata.

Cydippidæ, the family of *Ctenophora* (q.v.), including all the English species of the tentacle-bearing group. *Pleurobrachia* (q.v.) is the best known English representative of the family.

Cydnus, a river in Cilicia to the S. of the Taurus range, which flows past Tarsus to the sea. The water was clear and cold, and was supposed to have healing properties. Alexander the Great when heated bathed in the Cydnus, and nearly lost his life in consequence.

Cydonia. [QUINCE.]

Cygnet. [SWAN.]

Cygnus, a constellation lying between the pole-star and Aquila. Its five principal stars form an easily-recognised cross, the uppermost star being of first magnitude, and the lowest being a coloured double star. The distance of 61 Cygni was determined by Bessel to be about 60 billion miles. Struve calculated it to be more nearly 40 billion miles.

Cylinder, the surface formed by a line moving parallel to itself so that it shall always pass through a given closed curve. Usually the curve is a circle, and the line moves at right angles to it. In this case the volume of the cylinder is swept out by a rectangle revolving about one edge. The volume of a sphere is two-thirds that of the cylinder exactly enclosing it.

Cymbal (Gk. *kumbē*, hollow vessel) in the usual sense signifies a concave plate of bronze or brass, or other composition of metals, which, being struck against a similar plate, produces a clashing sound more useful as marking rhythm than as pleasing to a cultivated ear, though it must be allowed that there is something rousing and exciting in the barbaric sound. The word is equally applicable to the tiny metal castanet, and to the large orchestral cymbal which is generally an appendage of the big drum. There is also an organ stop called the cymbal.

Cymbeline, the name given by Shakspeare to a British king sometimes identified with Cunobelin. Shakspeare's Cymbeline had a daughter named Imogen, whose persecution at the hands of Cloten, and repudiation by her husband Posthumus Leonatus under a false suspicion of infidelity, and her subsequent discovery of her brothers, form the subject of one of Shakspeare's most charming plays.

Cyme, a general name for all forms of definite or centrifugal inflorescence. In these cases the main peduncle or "podium" terminates in a flower, others being subsequently developed laterally. Cymes are either *multilateral* (polychasial) or *unilateral*. In the former case two or three branches of equal vigour spring from below the terminal flower, themselves are terminated by flowers and repeat the process, as in the stitchwort (*dichasium*) or the thorn-apple (*trichasium*). In unilateral cymes, at each bifurcation only one branch grows vigorously, so that a *pscud-axis* is formed by the primary axis, one of its primary branches, a secondary branch, a tertiary branch, etc. These inflorescences are, therefore, also termed *sympodial*. They may either be *bostrychoid*, where each successive branching is on the same side, as in *Hemerocallis;* or *cicinnal*, where the vigorous branch is alternately right and left of the median line, as in the sundew (*Drosera*) and stonecrop (*Sedum acre*). These cymes, however, being often difficult to explain without careful study of development, are sometimes named after indefinite inflorescences which they resemble. Thus *Sedum* has a *spicate cyme; Campanula*, a *racemose cyme;* the guelder-roses, *corymbose cymes;* and *geranium*, an *umbellate cyme*. A crowded cyme of sub-sessile flowers, as in sweet-william, is called a *fascicle*, or if axillary, as in the box, a *glomerule*, whilst two glomerules in the axils of opposite leaves, as in the dead-nettles or the purple loose-strife, are known as a *verticillaster*. A somewhat irregular cyme is the *anthela* (q.v.).

Cynewulf, an Anglo-Saxon poet, probably of the 8th century, of whom not much is known. He wrote poetical riddles, two religious epics, the lives of SS. Guthlac and Juliana, and a poetical history of Christ's life.

Cynics, a school of Greek philosophers founded at Athens by Antisthenes in 444 B.C. Antisthenes was a follower of Socrates, and endeavoured to follow out his principles. Among his tenets were the principles that virtue should be the chief end of man, and that man should be independent of outward circumstances. Some of the sect carried this latter idea so far as to despise all opinions of others, and disregard all conventionalities and even decencies of life. It is doubtful whether their name was derived from their dog-like disregard of conventionality, or from the original place of their meetings. Diogenes of Sinope, the Cynic, and his tub are well-known to all.

Cynipidæ. [GALL FLIES.]

Cynoidea, a section of fissiped Carnivora, consisting of the family Canidæ (dogs and their allies). [DOG, FOX, WOLF.]

Cynomorpha (Dog-shaped Monkeys), the lower of the two divisions of Old World Monkeys, the other being the Anthropomorpha or Anthropoid Apes (q.v.). [BABOON, MONKEYS.]

Cyperus, a large genus of plants giving its name to the order *Cyperaceæ*, the sedges. It has a triangular stem, bearing leaves in three rows below, and clusters of distichous spikelets above, with a leafy involucre. The genus belongs mainly to the tropics, only two rare species existing in England. Several kinds have edible roots or tubers.

Cyphosoma, a genus of regular Sea Urchins characteristic of the Cretaceous rocks: *Cyphosoma königi* is one of the best known Chalk fossils. The genus is the type of the family *Cyphosomatidæ;* it occurs in the Eocene rocks of India, and also rarely in the upper beds of the Oolites.

Cypræidæ. [COWRIES.]

Cyprès (*as near as, so near*). In cases where a perpetuity is attempted to be created *in future* there is an essential difference between a deed and a will, for in the case of a deed all the limitations are absolutely void, but in the case of a will the courts, if it can possibly be avoided, do not construe

the devise as utterly void, but allow the will to be explained in such a way as to carry the testator's wishes into effect so far as the rule respecting perpetuities will permit, which is termed a construction "cyprès." For example, where a life interest is given by will to an unborn person, with remainder in tail to the child of such unborn person, the courts will give the estate tail to the first unborn person in lieu of his estate for life, so as to leave to the second unborn the chance of the estate tail in that way descending upon him, which it will do if not barred. Cyprès does not apply to personal property, there being no estate tail in such property. [CHARITY, PUBLIC.]

Cypress (*Cupressus*), a genus belonging to the sub-order *Cupressineæ* of the order *Coniferæ*. They have minute, scale-like leaves, generally overlapping in four rows; minute, elongated male flowers; and small rounded cones made up of from six to ten peltate woody scales, with a curved point in the centre of each, and numerous winged seeds in the axil of each scale. *C. sempervirens*, the common cypress, is a native of Persia and the Levant, its commoner variety (var. *fastigiata*) resembling the Lombardy poplar in outline, and reaching, in its native country, 70 to 90 feet. Its timber is hard, reddish, and very durable, and was used by the ancients for mummy-cases, statues of the gods, tables, cabinets, musical instruments, and building purposes. In Turkish cemeteries it is the custom to plant a cypress for every burial, and its dark-coloured foliage and "architectural" form give it a very funereal aspect. The largest known specimen is that at Somma, in Lombardy, 121 feet high and 23 feet round, supposed to be older than the Christian era. The other variety, *C. horizontalis*, spreading like a cedar, is less commonly planted in England. *C. Lawsoniana*, a beautiful tree, native of California, where it reaches a height of 100 feet, was introduced into Britain in 1854, and other Californian species are now grown, but cypresses seldom exceed 40 feet in height in Britain. *C. glauca* or *C. lusitanica*, the "Cedar of Goa," has been extensively planted round Cintra and elsewhere in Portugal. The name Deciduous Cypress is given to a very different coniferous tree, *Taxodium distichum*, which forms the cypress swamps of the Southern United States, and is perfectly hardy in England, reaching 50 feet or more in height. It has short twigs bearing minute leaves in two rows (distichous), the whole being feather-like in appearance, turning a bright russet or pink in autumn and falling off whole.

Cyprian (200–258), a noted Bishop of Carthage and martyr. He was of a patrician family and was wealthy. For some time he taught rhetoric at Carthage, and delighted to engage in controversy with the Christians. But Cœcilius, whose name he took, baptised him in 245, and he gave his wealth to the poor. He was made bishop, and ruled wisely and well. In 250, during the Decian persecution, he had to retire from Carthage. After this persecution he took a great part in the controversy as to the treatment of the Lapsi—those who had denied their faith during the persecution and now desired to be reconciled to the Church, and he was an advocate for leniency towards them. In the persecution under Valerian he was banished, and being afterwards made prisoner he was commanded to sacrifice, and on his refusal to do so was beheaded. Many interesting letters of his are extant. and among them are letters to Cornelius and Stephen—Bishops of Rome—whom he styles "colleagues." Some of his letters show that he had strong poetical feeling, and that he was keenly alive to scenery and the beauties of nature.

Cyprinidæ. [CARP.]

Cyprinodontidæ. [CARP.]

Cypriots, the primitive inhabitants of Cyprus, originally Aryans, and most probably immigrants from Lycia, in Asia Minor, akin to the Hellenes, afterwards largely mixed with Phœnician elements, and ultimately Hellenised. The Cypriot language was distinct from Greek, and written in an archaic character, closely resembling that of the Lycian monuments, and in which each character represents a syllable and not merely one sound. Hence it is of importance in the history of writing. Its best relic is the bronze tablet of Dali, found about 1850, near the site of Idalium, and containing a perfect inscription of 30 lines. Of the present population (209,230 in 1891), 180,000 are still Greeks and Maronites, the rest nearly all Turks.

Cypris, the commonest English genus of that group of "Water Fleas" known as the Ostracoda (q.v.), one of the orders of the Crustacea. *Cypris* abounds in fresh water, in which it swims by means of a pair of set or covered appendages at the abdominal end. The animal is protected by a small bivalved shell, composed of a horny material, and oval or kidney-shaped in form. The shells of the Cyprids accumulate in such abundance in the bottoms of the ponds in which they live that the mud is rendered quite fissile; the clays of the Wealden and parts of the Purbeck beds are thus easily broken into thin slabs. There are about 30 English living species.

Cyprus, in the east of the Mediterranean, and the third in size of the islands of that sea. It is 1,000 miles E. of Malta, and almost equidistant from Asia Minor on the N. and Syria on the E., being 46 miles from Cilicia and 60 miles from Latakieh, and is in the latitude of Crete. The length from Cape Drepano on the W. to Cape St. Andrea in the N.E. is 145 miles, and from Cape Gata in the S. to Cape Kormatiki in the N. 60. The average width is from 35 to 60 miles, but for 45 miles to Cape Andrea it has a tongue of land 10 miles wide. The island contains 3,707 square miles. There are two mountain ranges—one in the south, having the general name of Olympus, of which the highest peak is Mount Trodos, 6,590 feet in height, sends off spurs in various directions. The Olympus of the ancients was probably a not very lofty but conspicuous height now called Oros Stavro, 12 miles from Larnaca. The second range is a northern range along the coast from Cape Kormatiki to Cape St. Andrea, 100 miles in length, with an average height of 2,500 feet. The middle

district of Messaria is a broad plain of 60 miles long by 10 to 20 broad, watered by two streams from the south, one flowing to the Bay of Famagosta and the other to the Bay of Morphu. Owing to the disappearance of the ancient forests which provided timber for the Roman fleets, the rivers run dry, water is scarce, and much of the land is barren, though corn is produced in places. In olden time Cyprus produced much copper, to which indeed it gave its name in Latin, as well as silver, and Pliny speaks of its producing precious stones. There are still salt-works, but the mineralogy and geology of the island have not yet been fully explored. Of harbours there are none of importance, Larnaca and Limasol, the chief ones, being only roadsteads. The chief towns are Nikosia, the capital, Famagosta (anciently Salamis), the chief town under the Venetian rule, and well defended against the Turks in 1571, Larnaca, on the south-east coast, the chief place of trade and the most rising town of the island; Limasol on the south coast, and Paphos (which has a bishop). The history of Cyprus has been eventful. At first it was a Phœnician possession and the seat of the worship of Astarte, and then it became the seat of the worship of Aphrodite, with Paphos as its headquarters under Greek rule. It was then successively Egyptian, Macedonian, Persian, and Roman, and was a great stronghold of early Christianity. Later it fell under Saracen sway, and then Richard I. gave it to Guy de Lusignan. It then became Venetian, and then Turkish, and in 1878 was taken over by England to be administered for the Porte until Russia should retire from Kars and Batoum, till then held by Turkey. England in return pays the Porte £92,000 a year, a sum which exceeds the surplus revenue of Cyprus, which has to be supplemented by a parliamentary grant. The chief productions of the island are wheat, cotton, barley, flax, silk, tobacco, madder, wool, oranges, pomegranates, sponges, and wine. England has not done much yet in the way of planting forests and making roads. The climate is fairly good, and much of the illness from which our soldiers suffered in the early part of the occupation may be attributed to an injudicious choice of site for camping. [Cypriots.]

Cypsela, from a Greek name meaning a box, is the name of the fruit characteristic of the great order *Compositæ* (q.v.). It is inferior, consists of two united carpels, is dry, one-chambered, one-seeded, and indehiscent, and generally small in size. It is sometimes, as in the dandelion and thistle, but not always, surmounted by a tuft of hairs or *pappus* (q.v.). It is sometimes termed an achene, but differs from the true achene in being made up of two carpels, and in being inferior.

Cypselomorphæ, in Huxley's Classification a group of Birds containing the Swifts. [Swift.]

Cyrena, a genus of bivalved mollusca and the type of the family *Cyrenidæ:* the shell is generally somewhat wedge-shaped. *Cyrena* is of interest to geologists, as it usually inhabits estuaries and brackish water, and thus its abundance in some Eocene and older rocks indicates their estuarine formation. *Corbicula fluminalis* is a close ally of *Cyrena;* it is very common in the gravels of the London area, and survives only in some rivers in the eastern Mediterranean.

Cyrenaica (the Pentapolis of Roman times) is a district of Africa exactly opposite to Greece, about 250 miles in length, and extending inland for 80 miles. It is protected from the winds of the Sahara by mountains which slope gradually to the sea, presenting a very varied climate and temperature, and producing most of the fruits of tropical and temperate climates, corn, wine, perfumed flowers, and a plant called silphium, for which the district was noted in ancient times. Kingsley in his *Hypatia* speaks of the wheat ships of Pentapolis. Originally colonised by Spartans, it afterwards became a Roman province. Constantine gave it the title of Libya Superior, and it was then a highly important possession. In the seventh century it fell into the hands of the Arabs.

Cyrene, the capital of Cyrenaica, was founded in 631 by Battus the Spartan, whose dynasty reigned for 200 years as had been prophesied by the oracle of Delphi. It then became a republic and fell with the rest of the district under the Roman rule. The intellectual life of Cyrene attained a high standard. The town was renowned for its school of medicine; it produced Callimachus, the poet; Carneades, the founder of the Athenian New Academy; Aristippus, the founder of the Cyrenaic School; and last, though not least, the kindly and eccentric bishop Synesius, the friend of Hypatia, whose charming character and noble disposition have been well portrayed by Charles Kingsley. Many magnificent ruins and a number of hill-tombs testify to the former importance of Cyrene.

Cyril, St. (376–444), a militant bishop of Alexandria who was more noted for zeal than discretion, though doubtless allowance must be made for the troublous times in which his lot was cast. The measures for which he is chiefly memorable were the closing of the Novatian churches and the seizure of their treasures, the expulsion of 40,000 Jews upon a charge, possibly true, of ill-treating Christians, and his struggle with the time-serving governor of Orestes which culminated in the murder of Hypatia, the fair and famous neo-Platonic professor and lecturer. Charles Kingsley in his *Hypatia* gives a vivid picture of the times, and shows what a formidable instrument of aggression St. Cyril possessed in his army of fierce monks, but it is doubtful whether he has not allowed the more objectionable features of Cyril's policy to blind him to the difficulties he had to contend with. In later years the bishop's impetuous energy calmed down, and his opposition to the Nestorians was confined to writing against them and procuring their condemnation at the Council of Rome in 430, and at that of Ephesus in 431. With a view to ending the controversy the emperor Theodosius arrested both St. Cyril and Nestorius. When restored to liberty St. Cyril passed the rest of his life in peace. He has left numerous writings, vigorous in style, and many of them polemical in

character. Among his works are *Worship in Spirit and in Truth*, *A Commentary upon Isaiah and other Prophets*, *A Commentary on St. John's Gospel*, and *The Mystery of the Incarnation*. His feast-day is the 28th of January.

Cyril, St. (315–386), a patriarch of Jerusalem and a father of the Greek Church. He was made patriarch in 350, and in 351 the appearance of what seemed to be a cross in the heavens was thought to approve the appointment and led to many conversions. He was chased from his see by the Arians, but came back in 361 under the system of toleration practised by Julian. In 367 an edict of Valentius again drove him forth, but in 379 he was back again, and two years later agreed in the condemnation of the semi-Arians and the Macedonians at the Council of Constantinople. He left behind him twenty-three catechetical treatises, for in his earlier years he had been instructor of catechumens. His feast-day is the 18th of March.

Cyril and Methodius, SS., apostles of the Slavonians in the ninth century, were born of a noble family at Thessalonica. The elder, Constantine, studied languages and gained the title of "the Philosopher," and became a priest; the younger was first soldier, then monk. The Emperor Michael III. sent Constantine on a preaching mission in 860; and later both Cyril and Methodius went on a mission to the Moravians and Bulgarians. Methodius converted the king of the latter by a painting of the Last Judgment. Adrian II. made them both bishops, and the elder now took the name of Cyril. He still kept up his literary studies, and his Slavonic alphabets are the foundation of those now in use in Russia and Servia and still keep his name. Cyril died in 868, and Methodius, after becoming archbishop of Moravia and Pannonia and obtaining from Pope John VIII. the recognition of the Slavonic liturgy, died in 881. Their feast-day is the 9th of March.

Cyrus, a great Persian conqueror, and first historic hero of Asia. What we know of his life is gained chiefly from Herodotus and Xenophon. But while the former gives us history as nearly as he could ascertain it, the latter treats us to a historical romance. Following, then, mainly the story of Herodotus, we find a character who has been described as a Genghis Khan or Tamerlane of ancient times. Astyages, king of Media, had a daughter, Mandane, who was married to Cambyses, a prince of Persia, which was at that time subject to Media. Before the birth of her son Mandane had some portentous dreams, which seemed to foreshadow some danger which would arise to the state through her offspring. The prudent grandfather condemned the child when born to death, but, as usual in these cases, the victim escaped the snare, and was brought up as a peasant boy by a friendly shepherdess; and, true to his mother's dreams, he roused the wild Persians against the Median power, and dethroned Astyages in 559. But, in fact, Cyrus was of the powerful Persian tribe of Pasargadæ, and the renowned family of the Achæmenidæ, and in all probability his conquest of Media was the result of a natural and inevitable tribal migration. After conquering Media, he proceeded further to take Mesopotamia and carry war into Babylonia. He was attacked by Crœsus, the wealthy king of Lydia, with disastrous consequences to that king, who succumbed to the young conqueror. Next Cyrus conquered Assyria, and, advancing upon Babylon, forced an entry into the city by turning the stream of the Euphrates (538 B.C.). His generals had, meantime, subdued Asia Minor, including the Greek cities, and had possession of Syria, Phœnicia, Palestine, and part of Arabia, so that the sway of Cyrus extended from the Indus to the Ægean Sea and from the Caspian and Black Seas to the Arabian Gulf. He was preparing for the conquest of Egypt when he fell in an expedition against the Scythian tribe of Massagetæ, and Queen Tomyris is said to have thrown his severed head into a bag of blood that he might sate his thirst for that liquid. Cyrus had some claim to the title of civiliser, for he divided his dominion into 120 satrapies, or minor governments, established couriers on all the public roads, and was a protector of agriculture. An incidental consequence of his conquest of Babylon was the freeing of Jewish captives and the permitting them to return to Jerusalem.

Cyrus, commonly called the Younger, was the son of King Darius Nothus and of Parysatis. His father made him satrap of Lydia and Asia Minor, and here Cyrus gained the friendship of the Spartan Lysander, and aided the Spartans in their struggle for the supremacy in Greece. In this he went counter to what was the traditional Persian policy, which had for its object the fomenting of Greek divisions so as to make union impossible. At a later period he conspired against his brother, Artaxerxes, but failing in his object, was forgiven and reinstated in his government. He again meditated designs against his brother, and with a large army, increased by 10,000 Greek mercenaries, he set out from Sardis, but in 401 was defeated and slain at the battle of Cunaxa. The famous retreat of the 10,000 Greeks has been immortalised by its leader and chronicler, Xenophon.

Cyst (Gk. *kustis*, a bag or pouch). A cyst is well exemplified by such structures as the gall-bladder or urinary bladder—*i.e.* it is a bag containing fluid. The term cyst is, however, commonly applied not to these normal structures but to "fluid tumours" of new formation. Thus there is the blood cyst, the synovial cyst, or enlarged bursa (q.v.), the serous cyst as in hydrocele (q.v.), the sebaceous cyst (q.v.), and so forth. Cysts of the ovary will be dealt with under the title Ovarian Tumours. Hydatid cysts occur in the liver, lungs, and elsewhere. [Hydatid.]

Cystic Worms, the Cestoidea (q.v.).

Cystin, a substance of composition $C_6H_{12}N_2O_4S_2$, which crystallises in yellowish hexagonal plates. It seems to be present in very small quantities in urine, and occurs sometimes in urinary calculi.

Cystiphyllum, an extinct genus of corals

belonging to the order Rugosa (q.v.) and the type of the class *Cystiphyllidæ*. The main character of this family is that the centre of the coral is occupied by a mass of irregular, vesicular tissue, and neither the radial septa nor the transverse horizontal "tabulæ" (q.v.) are continued across it. The genus is especially common in the Upper Silurian and Devonian limestones.

Cystitis, inflammation of the urinary bladder.

Cystoidea, a class of Echinodermata of great interest to the student, as it appears to include the nearest form known to the ancestral Echinoderm. The whole class is extinct, and was confined to the Palæozoic era, being most abundant in the Silurian. It is hardly possible at present to draw up any precise definition of the Cystoidea, and in all probability the group of forms now included under this name will have to be broken up. The Cystoids are usually spherical or ovate in form, and are composed of a variable number of plates irregularly arranged and with the radial symmetry typical of the Echinoderms imperfectly developed. The mouth opens on the centre of the upper surface; around it there may be a circle of arms; the arms are often bent back and soldered to the plates of the body (as in *Callocystis*) or they may be absent; in the former case the arms play the part of food grooves. On the side of the body there are other openings, as to the true functions of which opinions differ; one of them is probably anal and another ovarian. In many Cystoids there is a long stem (*e.g.* in *Caryocrinus*) and this may end in a spindle-shaped solid piece (*e.g.* in *Lepadocrinus*); in others the stem is absent. Most of the plates are perforated by series of pores; the function of the pores probably varied in different groups, but in most they appear to have been connected to a series of respiratory tubes known as the "hydrospires." In the most typical Cystoids—the "Rhombifera"—the pores are fairly large, and each opens in a rhomb-shaped area or "pore rhomb"; such *e.g.* is the case in *Glyptocystis*, and these almost certainly opened to hydrospires: in others the pores are small and numerous, as in *Callocystis*. In another group—the Diploporitidæ—the pores are in pairs, as in *Glyptosphærites*, and these may represent tube feet. In the third order or Aporitidæ the pores are absent. The affinities of the Cystoids are at present very uncertain; in some, as *Atelecystis*, the arrangement of the plates is so irregular that the radial arrangement of the internal organs that is so characteristic of the Echinoderms had probably not been developed. Most of the higher Cystoids are clearly related to the stalked Echinoderms or "Pelmatozoa" (Sea Lilies, etc.); hence the whole group was once included in this sub-class. But some Cystoids such as *Lichenoides* had no stem, and consequently cannot be included in the Pelmatozoa. The Cystoids are represented by some imperfectly known genera in the Cambrian, attained their maximum in the Ordovician and Silurian, and died out in the Carboniferous, the last genus being the remarkable form known as *Agelacrinus*. A few years ago the discovery of a living Cystoid was announced: it was named *Hyponome*, but it was subsequently proved to be only the central visceral mass of a "Rosy Feather Star" (*Antedon*) separated from its arms and skeleton.

Cytisus, a considerable genus of *Leguminosæ*, mostly woody. *C. Laburnum*, a native of France, Switzerland, and South Germany, where it exceeds 20 feet in height, is a tree popular in English gardens for its pendulous racemes of yellow flowers. It has a dense dark-brown heart-wood, resembling ebony; ternate leaves, and seeds containing two poisonously emetic alkaloids, *cytisine* and *laburnine*. *C. scoparius*, the Broom (q.v.), is a shrub often referred to a distinct genus (*Sarothamnus*) from its spiral style. Its seeds contain the purgative *sparteine*. *C. purpureus* is a procumbent shrub native to Carniola, seldom exceeding a foot in height. *C. purpurascens* or *Adami* is a graft-hybrid of *C. Laburnum* and *C. purpureus*, interesting as illustrating the influence of the stock on the scion [GRAFTING], as the same cluster sometimes contains yellow, purple, and intermediately-coloured, or reddish, flowers. *C. racemosus* is a common shrubby pot-plant, with erect racemes and minute leaflets.

Cyzicus, a peninsula, about 9 miles long (once an island), and town of Asia Minor, on the coast of the Sea of Marmora. Alexander is said to have joined the peninsula to the mainland by a series of moles and bridges. It played a great part in the Peloponnesian war, in which it was alternately an Athenian and a Lacedæmonian possession. It afterwards became Persian and then Roman. An earthquake in the time of Antoninus Pius wrought much damage, and noble ruins are now covered by vines and cherry-trees. Quantities of coins, of inestimable value to the numismatologist and to the historian, have been found, and the device upon some of them is said to have given rise to the Latin proverb—"*Bos in linguâ*." The town was taken by the Arabs in 675.

Czar, or TZAR or TSAR, a title used by the Mongol princes of Russia, and connected with the Roman *Cæsar* and Teutonic *Kaiser*. Many independent princes held the title, and it was not till 1547 that Ivan the Terrible made it specially Russian on taking the title of Czar of Moscow. Peter the Great was the first to claim Imperial rank as an accompaniment of the Czardom, and his claim was not for some time acknowledged by European courts. The name was also applied in the eighteenth century to some article of dress, possibly a cravat.

Czartoryski, a famous Polish princely family name, the most noted of the family being CZ. Adam George (1770–1861). He was born in Warsaw, and after an education in England he went home, and in 1792 took part in a campaign against the Russians. After the partition of Poland (1795) he was sent with his brother Constantine to St. Petersburg as a hostage to Catherine II. Here the Grand Duke Alexander became his friend, and in 1797 Paul I. entrusted him with an embassy to Constantinople. When Alexander became Czar in 1802 he made his friend Foreign minister, and in

this capacity in 1805 Czartoryski signed the treaty between England and Russia. For some motive he took no part in Napoleon's movement in favour of Poland, and in 1814 he was with Alexander in Paris. He was not, however, without patriotic inclinations, and in 1815 he, as head of the University, upheld the students of Wilna against Russian oppression. He lived in retirement from 1821 to 1830, but in 1831 he was made supreme governor of Warsaw. He boldly told Czar Nicholas that his policy would lose him Poland, but there was no love lost between the two, and the Czar later confiscated his lands. In consequence of his dissatisfaction with the state of Russia Czartoryski came to Paris, but he was distrusted by his compatriots, and though part of his lands were confiscated in 1846, and he emancipated his serfs in 1848, the Polish colony had no real confidence in him, and he had no great influence among them. He died in Paris.

Czaslau, an Austrian town of Bohemia, 40 miles S.E. of Prague, of the government of which it forms part. A notable feature of the town is its church with a tall spire. Here the Hussite chief, John Ziska, was buried. The town was also the scene of a Prussian victory over the Austrians in 1792. The country around is mountainous but fertile, with extensive pastures.

Czegled, a market town of Hungary, 50 miles S.E. of Pesth, in an agricultural and wine-growing district.

Czenstochau, a Polish town in the government of Warsaw, on the Warta, near the Silesian frontier, and near the Warsaw and Cracow railway. Just outside is a convent noted for its miraculous picture of our Lady painted (so says tradition) by St. Luke upon a panel furnished by St. Joseph. Many pilgrims visit this picture. The monks were expelled in 1867 upon political charges. The town made a brave defence against the Swedish army in 1655.

Czernowitz, an Austrian town on the right bank of the Pruth, in the government of Lemberg, and about 400 miles from Vienna. It is the seat of a Greek bishopric. There are many goldsmiths and jewellers, and the district produces leather, metals, and raw material. The country round consists of outlying spurs of the Carpathians, and contains large forests. Wheat and flax are grown, and silver, iron, and copper are found.

Czerny, KARL (1791–1857), pianist and composer, and son of a professor of music, was born at Vienna. At the age of ten he showed such proficiency that he was taken in hand by Beethoven as well as by Sebastian Bach and Clementi. But for much of his life he gave all his energies to his pupils, some of whom achieved brilliant success, and though he published at thirteen, his productive powers slept till he was forty, when he made up for lost time, and produced no less than 800 pieces. He also wrote a *Practical School of Composition*, and an *Outline of a History of Music*.

Czerny-George, PETROVITCH (1779–1817), the liberator of Servia, is said to have been of French origin, and to have derived his name from his swarthy hue. Brought up as a peasant, he killed a Mussulman oppressor and fled to Transylvania for refuge. He served in the Austrian army against the Turks, but having to leave the Austrian service through some infraction of discipline, he turned bandit. This life not suiting him, he was soon serving again in the Austrian army. He then went to Servia, where he was a prosperous cattle-breeder, and became very popular. The pasha of the district was murdered by the janissaries. Czerny headed a successful movement against the janissaries, and his action gained the approval of the Sultan—an approval, however, which changed into disgust when he found Czerny extending the movement to the securing of Servian independence subject to the suzerainty of Turkey and a tribute to Constantinople. But this freedom once secured, Czerny seems unaccountably to have lost all energy, and his intrepidity turned to vacillating timidity. As a result of this weakness his enemies made head against him, and he was strangled and his head sent to Constantinople.

D

D, the fourth letter of the alphabet, derived from the Chalkidic form of the Greek delta (Δ) adopted by the Romans from the Sicilian Greeks. [ALPHABET.] The Greek Δ occurs also as ▷ in the alphabet of Corinth. It is probably derived from a hieroglyphic representing the triangular doorway of a tent. The Roman D is the numeral sign for 500. In music D is the second note of the natural scale.

Da Capo (Ital. *from the beginning*), in *Music*, is printed at the end of the second part of an air with two parts, to signify that the first part must be repeated as a conclusion. Another form of it is DAL SEGNO (*from the sign*).

Daan, a term applied to three different Berber peoples in Algeria, who are respectively distinguished as Uled Sgar, Uled Bedar, and Uled Ghamrez Daans. They occupy a mountainous region some 20 miles south-east of Guelma, about the headwaters of the Melah, affluent of the Seybouse. All are closely-related members of the Shawiya branch of the Berber family. The Uled-Dhans of Kennugha, near Mount Shukchof, belong to the same connection. In their territory are some Roman ruins in the neighbourhood of several still frequented thermal (sulphurous) waters.

Dab (*Pleuronectes limanda*), one of the commonest of the Flat-fish (q.v.), found on all the Northern coasts of Europe. It is rarely more than a foot long; the general hue of the upper surface is light brown with dark spots. It frequents smooth, sandy bays and feeds on small marine animals. The flesh is better flavoured than that of the plaice or flounder. *P. microcephalus*, the Smear, Lemon, or Smooth Dab, ranging to Scandinavia and Iceland, is rather larger, and is also valued for the table.

Dabchick, a popular name for the Lesser Grebe. [GREBE.]

Dacca, a city and district of Bengal. The district, containing about 2,797 square miles, consists for the most part of mountainous land and of level plain intersected by a network of rivers and watercourses, forming in the wet season almost an inland sea, dotted here and there by island farms protected by dykes, and presenting features familiar to those who know the Low Countries. About two-thirds of the area are under cultivation, producing among other things indigo, rice, jute, cotton, and sugar-cane in such profusion that the district has obtained the name of the "granary of Bengal." It has extensive forests well stocked with elephants and tigers and other wild animals, and its inhabitants are noted as adventurous boatmen. Owing to the excessive moisture, the country is fertile in dysentery, goitre, fever, with occasional visitations of cholera and small-pox. Earthquakes, too, are not uncommon. Of the population, which exceeds two millions, about sixty per cent. are Mahometan. The city, which is on the bank of a small river uniting the Ganges with the Brahmapootra, lies about 150 miles N.E. of Calcutta. From 1610 to 1704 it was the seat of the Mahometan government of Bengal, and the ruins of mosques and other buildings in the neighbourhood bear witness to its former extent. It once had a great renown for its muslins, but English manufactures beat it out of the field, and from a population of 200,000 at the beginning of the present century it fell to 68,000 in 1838. By reason of its command of the waterways of the delta it is well situated for commerce, and it now has good schools, a hospital, and waterworks.

Dachshund (Ger. *badger dog*), a breed of dogs introduced into England by Prince Albert about 1850. They are allied to the Turnspit (q.v.), but have the points of that breed exaggerated, and the fore-limbs are bent outwards at the wrist. The body is long, the legs short, with strong paws well fitted for digging, and the head with its long drooping ears is not unlike that of a bloodhound pup. The favourite colours are black and tan, and brown.

Dacia was the name of the ancient kingdom of the Getæ, having on the N. the Carpathians, which separated it from Sarmatia, on the S. the Danube, on the E. the Black Sea, and on the W. the Theiss. Once it included Transylvania, part of Hungary, Wallachia, Moldavia, and Bessarabia, but the Roman province of Dacia was more confined. Herodotus calls the inhabitants Thracians, and, according to Strabo, the Daci and Getæ spoke the same tongue. Under the name of Davi the inhabitants were known in Rome as slaves, of which fact Terence gives us testimony. In 10 B.C., when attacked by the Romans, they made a brave defence, and in 101 A.D. Decebalus proved a formidable foe to the Emperor Trajan. Ovid, who was exiled thither, has given some idea of the climate. Roman colonies were planted there, and the Danube was bridged over, but Aurelian withdrew the colonies, making the Danube the boundary, and abandoning Dacia to the Goths, who in their turn had to yield to the Huns.

Dacier, ANDRÉ (1657 or 1651–1722), a French philologist, who, born at Castres, studied at Saumur, and was there the pupil of Tanneguy-Lefèvre, with whose daughter Anne he shared the professor's tuition. After the death of Lefèvre he returned to Castres, and from there went to Paris, where he prepared an edition of *Festus* for the celebrated *Delphin* issue. In 1683 he married Anne Lefèvre, whose erudition caused the union to be spoken of as the "wedding of Greek and Latin." In 1685 they both joined the Catholic Church, and in 1695 the husband became a member of the Academy and keeper of the books at the Louvre. In 1713 he was appointed perpetual secretary of the Academy. Among his many works was an edition of Horace, with translation and criticism.

Dacoits (Hindu *dakait*), the name given to the gangs of robbers which infest the districts of Lower Bengal and other parts of India. *Dacoity*, or robbery by gangs, is prevalent in India and Burmah to a considerable extent.

Dacosta, ISAAC (1798–1860), a Dutch poet, born at Amsterdam, his father being a Portuguese Jew. He studied at Leyden, and in 1821 became a Christian. After the death of Bilderdijk he was the chief poet of Holland. In poetry his best known works were *Political Poems*, *Hesperides*, and *The Battle of Nieuwpoort*, and he also wrote a treatise on *Israel and the Gentiles*.

Dacres, the name of a distinguished naval family, of which the most celebrated members are Vice-Admiral James Richard Dacres (1749–1810), Vice-Admiral Sir Richard Dacres (1761–1837), Vice-Admiral James Richard Dacres, junior, who died in 1854, and Admiral Sir Sidney Colpoys Dacres (1805–1884).

Dactyl, in classical metres, a foot consisting of one long followed by two short syllables (like *e.g.* the word "Gĕrmănў" in English), so called from a fancied resemblance to the joints of the finger (Gk. *daktulos*). Also, a similar arrangement of notes in music.

Dado (Spanish and Italian *dado*, a cube, a die, English *die*), in *Architecture*, properly the face of a pedestal between its base and its cornice. This part being sometimes coloured or otherwise ornamented, the name has been applied to the lower part of the surface of the inner walls of a room, when ornamented somewhat similarly and contrasting with the upper part. Thus, a margin or skirting, some three or four feet high, running round the walls and papered, painted, or panelled, or hung with some woven material, is now called a dado, a term rendered familiar by the "æsthetic movement" about 1880.

Dædalus (from the Greek *daidallein*, to work artistically) is the name of a half mythological half historical man who was the most ancient Greek sculptor, architect, and mechanician, and the father of Cretan art. He is supposed to have lived in the 13th century B.C., and to have been

contemporary with Theseus and Minos. Originally of Athens, he is said to have killed his nephew who was a rival artist, and to have been exiled and to have taken refuge in Crete, where he constructed the labyrinth for Minos. Shut in this labyrinth with his son Icarus, he made wings and the two escaped, but Icarus flew too near the sun and melted the wax which fastened his wings, and, falling, was drowned in the sea which afterwards bore his name. Some have explained this wing story by saying that Dædalus invented sails by means of which he outstripped Minos's rowing-boats. Dædalus is said to have reached Cumæ and to have gone to Sicily, where he built a fortress for the king. What Orpheus was to poetry, says one writer, and Linus to music, such was Dædalus to mechanics.

Daffodil. [NARCISSUS.]

Dafîr (ZAFÎR, ZEFÎR), one of the great Bedouin tribes of Arabia, occupying all the north-eastern part of the peninsula between Nejd and the Lower Euphrates. They comprise six main branches: Beni Saïd, el-Areif, Ab'edra'a, el-Na'alîm, el-Feluh, and el-Messamir, with a large number of subdivisions. Their domain is limited on the north-west by that of the Anezeh Bedouins, and on the north by the Montefiks of the Euphrates Valley.

Dafla (DOFLA, DUFLA), an uncivilised people of the Eastern Himalayas, north of Assam, near the north-east frontier of British India, between the Brahmaputra and the Chumlari Hills. The national name is Bangni (Banghîn); that is, "Men," and they are related to their western neighbours, the Abors, both being offshoots of the Bod (Tibetan) race. They till a little land round about their scattered settlements, but their chief resource is hunting, especially since their predatory expeditions into the fertile plains of Assam have been suppressed by the Indian Government, which allows a subsidy of £240 to the chief headmen. They practise both polygamy and polyandry, and otherwise live in a very primitive state, with little social organisation—no religion, priests, or even medicine men.

Daghestan, a district of 11,400 square miles with 530,000 inhabitants, forming a Russian government in the Caucasian territory. The country, whose name signifies "mountainous" in Turkish, extends from the Upper Terek Valley to the Caspian, and is penetrated by three spurs of the Caucasus, one of which near the capital, Derbend, divides the land into North and South. Since its re-organisation in 1867 it comprises the Russian administrative divisions of Lesghistan, Tarku, and Derbend, with parts of the ancient kingdom of Georgia. It is a sort of Switzerland, with mountains, valleys, lakes, and torrents flowing into the Caspian. The land is fertile, and there is much rain. Among the products are wheat, tobacco, fruits, and abundance of wild vines which yield good grapes. Cattle are reared in the mountains, and the forests abound in game. The camel, horse, ass, mule, sheep and goat are reared. Among the minerals are lead, sulphur, and iron. Russian authority has been acknowledged since the submission of Schamyl in 1859, but is not very firmly fixed.

Daghestani (that is, *Highlanders*), a term applied collectively to all the peoples of the Eastern Caucasus. The term *Lesghi*, the *Ligyes* of Herodotus, is often applied in a general way to these populations, of which the Lesghians proper form one of the chief branches. [LESGHIANS.] But these are quite distinct, at least in speech, both from the Andi, Dargo, Dido, Duodez, Ude, and Kubachi, who are usually grouped with them, and from the Chechenzes, who form another great division of the Daghestani peoples [CHECHENZES], and with whom are more or less closely connected the Ingush, Galgai, Karabulak, Kist, and Tush tribes. Total population (1890) of all the Daghestani aborigines, 708,000. All observers comment on the extraordinary number of apparently fundamentally distinct languages still current among the aborigines, some common to large groups, such as the Avars, Lesghians, and Chechenzes, but others confined to quite small communities, such as the Udes, Kubachi, and Dido, occupying a few isolated villages in the more inaccessible parts of the Eastern Caucasus. [CAUCASIANS II.]

Dago, a Russian island in the government of Esthonia at the entry of the Gulf of Finland, and N. of the island of Œsel, from which it is separated by a narrow channel. It became Russian in 1791, and the inhabitants who are Danish, Swedish, and Russian, subsist chiefly by hunting and fishing—especially sealing. There is some coasting trade. Area 370 square miles.

Dagobert, the name of some of the Merovingian dynasty of Frankish kings, of whom, perhaps, the most notable was Dagobert I. (602–638), the son of Hlother II. He won victories over the Bretons and Gascons, and founded the Abbey of St. Denis. His reign was the last flash of Merovingian brightness.

Dagon, the national god of the Philistines, or, as some think, the generic name of a set of beings such as the satyrs or Fauns of classical mythology. The cities Ashdod and Gaza were the headquarters of his worship, and he is generally supposed to have been represented as having the head and hands of a man with the lower parts of a fish. There is some doubt, however, upon etymological grounds whether he was a maritime god or the god of corn and fertility.

Daguerreotype, a photographic printing process which takes its name from that of its inventor—a Parisian scene-painter, Daguerre. The discovery was publicly announced in 1839, and Daguerre and his partner, Niepce, received life-pensions from the French Government. The process, though not of any present photographic value, is interesting as being the first practical method of fixing the image obtained by the camera, and on account of the impetus hence given to photography. It is carried out in the following manner:—A smooth copper plate is silvered, and the surface thoroughly cleaned and perfectly polished. It is then exposed in a small box to the vapours of—(1) iodine; (2) bromine,

by which operations a film of silver bromo-iodide is formed upon the plate. After being again submitted for a shorter time to the action of iodine vapour, it is ready for use in the camera. A few seconds' exposure suffices for the formation of the latent image, which must be afterwards *developed* by the action of mercury vapour, obtained by heating the metal to about 170° C. When developed, it is *fixed* by immersing in a solution of sodium hyposulphite, and, if desired, can be *toned* by means of gold chloride. The operations of sensitising and developing should, of course, be performed in yellow or ruby light.

Dahlgren, John A., American naval officer, was born at Philadelphia in 1809, and at a comparatively early age turned his attention to the construction of heavy guns. In 1847 he became chief of the Ordnance Department at Washington, and while there invented the smooth-bore guns which bear his name. In 1863 he was given command, as rear-admiral, of the South Atlantic squadron, with which he organised the blockade of Charleston, and made several fierce attacks on the seaward defences of the town. These culminated in a gallant but unsuccessful assault on Fort Sumter. The admiral died in 1870.

Dahlia, a genus of herbaceous plants belonging to the order *Compositæ*, named after Dr. Dahl, a pupil of Linnæus. *D. variabilis*, a native of Mexico, where it grows in sand at an altitude of 5,000 feet, was introduced into Europe in 1784 and again in 1804. It has fasciculate, spindle-shaped, tuberous roots, which were expected to prove edible but are acrid. The plant grows seven or eight feet high in rich loam, but becomes dwarfed in lighter soil. Its foliage is coarse, and the whole plant is glabrous. The head of flowers is surrounded by a double involucre, and has a chaffy receptacle and no pappus. When first introduced the head of florets was flat, the disk yellow, and the ray a dull scarlet; but under cultivation it speedily varied into an infinite number of forms and colours. In many of these the head has become globular, and the corollas of all the florets are alike horn-shaped or funnel-shaped. [Doubling of Flowers.] Fashion has of late returned to "single flowers," *i.e.* heads with large ray-florets and a distinct disk. The plants can be raised in a frame from seed sown in March, or from cuttings; they require protection from north and east winds, and different varieties are in bloom from June to November.

Dahlmann, Friedrich Christoph (1785–1860), a German politician and historian, born at Weimar. After studying at Copenhagen and at Halle he went in 1810 to the former city, and lectured on Aristophanes. His speciality was history, and in 1813 he was appointed Professor at Kiel. In 1815 he became Secretary of Schleswig-Holstein, and gave offence to the government by upholding the rights of the Germans in Denmark. He left the country in consequence, and in 1829 became Professor at Göttingen, and was a great light of the *doctrinaire* school of moderate Liberals. In 1837 he resigned and retired first to Leipzig, then to Jena, and in 1842 he became Professor of History at Bonn. In 1848 he again for a time came to the front in politics, but he soon went back to private life. Among his chief works are a *History of Denmark*, *The Sources of German History*, a *History of the English Revolution*, and a *History of the French Revolution*.

Dahomey, a negro kingdom on the N. coast of the Gulf of Guinea, whose limits are undefined. It has a seaboard of 35 miles, and the coast region has many swamps and lagoons, of which the principal are named Avon and Dereham respectively. Inland it stretches 65 miles to the Kong mountains. Whydah is the chief port, and the capital is Abomey. The land is fertile, and produces plentifully palm oil, maize, beans, peas, tropical fruits, cotton, sugar, and spice. Sheep, goats, and poultry are sparingly bred, and there is some manufacture of cotton cloths, and of weapons and tools of native iron. The climate is fairly good, and the strong winds which often prevail keep the air purified. The greatest drawback to life in Dahomey is the prevalence of the "Guinea worm." During a great part of the year the coast is almost unapproachable owing to the breakers and surf which are known as the "Guinea Coast Bar." There is a little iron and copper in the country, but gold and silver are plentiful, and the natives display great taste in working them. Dahomey was once a great centre of the slave trade, but this profitable industry has almost ceased. There is no real standing army except the famous Amazons, who probably do not number more than 2,000. The French hunter, Jules Gérard, was deceived on this point by their being marched over and over again in front of him after the fashion of a stage army. It was not till the 18th century that Dahomey came much into notice, and the first king of note was Ghezo, who in 1852 made a treaty with England for the abolition of the slave trade. He died in 1858. Gelele, a later king, received an English mission in the person of Captain (afterwards Sir Richard) Burton. In 1876 the ports were blockaded by England. In 1890 France obtained a protectorate by a treaty with the king, Behanzin, which he afterwards repudiated.

The Inhabitants. The Foys (Ffon, Effon), as they were formerly called, appear to have originally migrated from the Upper Niger Basin to their present homes, where Taku-donu, founder of the royal dynasty, established himself at Ardra (Allada), and about 1625 built the palace of Dahomi (Dahwomi), from which his subjects gradually adopted the name of Dahomans, though their language is still called Ffon or Effon. This language, which is allied to the Ga and Tchi of the Gold Coast, is a chief member of the Ewe (Ehwe) group, of which the other branches are the Mahi (Makki) of the hill country in the interior; Anfuch, current in the districts of Anfuch, Trepe, Ehwe-anio, Agotine, and others along the left bank of the Volta; Awuna (Aulo) on the south-west coast; Whydea (Hweta) and Ehwemi on the south and south-east coasts towards Yorubuland, with total range of 150 miles along the seaboard, and

perhaps 200 miles inland. The Dahomans are typical negroes, somewhat more advanced in the social scale than their western neighbours, the Ashantis of the Gold Coast, but greatly inferior to the Yorubas on their eastern frontier. Amongst them the early closing of the cranial sutures is very marked, so that skulls of adults are often found without any visible transverse or longitudinal sutures. Hence, although quick and intelligent in their youth, they make little further advance after the age of puberty, when the mind is arrested while the physical nature acquires its full development, mastering and even deadening the mental qualities. They are impulsive without application, imitative without invention, indolent and energetic, though, like children, subject to sudden outbursts of passion, cruel and strangely insensible to physical suffering, as shown by the sanguinary rites and atrocities associated with the periodical "customs." These customs are said to have been instituted by Takudonu's successor, Adahunzu (Adanzu), second king of Dahomey, who died about 1650. But the prevalence of similar practices amongst the Ashanti and other kindred peoples is sufficient proof that such horrors have formed part of the social and religious life of the Upper Guinea populations from the remotest times. (*See* Dalzel's *History of Dahomey*, 1793, and Major A. B. Ellis, *The Ewe-Speaking Peoples of the Slave Coast*, 1890.)

Daimios, the feudal nobles of Japan, originally chiefs subject to the Shógun or commander-in-chief (popularly called Tycoon), whose government practically displaced that of the Mikado until the revolution in 1868. The country was parcelled out among them, and the Shógun was their overlord. [JAPAN.]

Dairy (from a Norse word *dey*, a farm servant), a place where butter and cheese are made. The old-world dairy of poetry and art is being rapidly superseded by the co-operative "creamery," or cheese factory. [BUTTER, CHEESE, AGRICULTURE.]

Dairy Farming. [AGRICULTURE.]

Dais (Low Latin *discus*, a dining table), the name of the raised platform at the end of a college or castle hall, on which the lord and his immediate companions, or the head and fellows, sat to dine. In French the word has been again transferred to the canopy which sometimes was over this part of the hall, and thence to the canopy over a throne or altar.

Daisy (or else "the eye of the daie," as Chaucer calls it, the "bairnwort" of Yorkshire) is the favourite flower of children and of the poets of nature, from Chaucer to Burns. It is the "marguerite," or pearl, of the French. *Bellis perennis*, the common daisy, is the only British representative of its genus, one of the *Compositæ*. It is a perennial, growing throughout most of Europe as a weed in grass, with a short stem, a rosette of numerous, slightly hairy, spathulate leaves and scapes an inch or two high with yellow disk florets and white ray ones, pink at their tips and on their under-surfaces. Garden varieties are often "double," or have all the florets crimson. That known as the "hen-and-chicken" daisy is interesting morphologically, as the ten or twelve bracts of the involucre have each an axillary branch bearing a small inflorescence. The daisy blossoms almost all the year round. The ox-eye, or moon, daisy is the common larger-flowered meadow weed, *Chrysanthemum leucanthemum*, and the name Michaelmas Daisy is given to autumn-flowering species of *Aster* (q.v.).

Dakota, since 1861 a territory of the United States of America, situate in lat. 42° 28′ to 49° N., and long. 96° 25′ to 104° 5′ W., having on the N. Assiniboia and Manitoba, on the S. Nebraska, on the E. Minnesota and Iowa, and on the W. Montana and Wyoming; in 1889 the territory was formed into two states of nearly equal size, N. Dakota, with capital Bismarck, and S. Dakota, with capital Yankton. It consists mostly of plain, till lately prairie and covered by herds of bison, with a stretch of high plateau running from N.W. to S.E., and a smaller stretch to the E. of James river valley. The country seems once to have been the bed of a great lake, and consists largely of glacial and alluvial drift. The territory is well watered by the Missouri, which flows from N.W. to S.E. and receives many tributaries, and by the Red River which flows N. into Lake Winnipeg. In the S.W. is the district of the Black Hills, which covers 3,000 square miles and rises to a height of 8,200 feet. The country produces good varieties of stone, clays, chalk, and gypsum, and part of it is underlain by beds of lignite. There are springs of natural gas. Among metals, gold is largely worked, as is silver to a smaller extent, and more tin is produced by Dakota than by any other part of America. The climate much resembles that of the neighbouring parts of Canada—warm summers with cool nights, and cold but bright and exhilarating winters. Blizzards and cyclones are not infrequent. The land, by reason of its freedom from timber, is specially fitted for farming and grazing. The rapid strides made by civilisation in these days is shown by the fact that in 1851 a first treaty was made with the Indians for part of their hunting grounds; and now the bison has gone, and the Red Indian is fast disappearing.

Dakotas, one of the stock races of the American aborigines, called also Sioux [SIOUAN], formerly widespread throughout the Mississippi basin (North and South Dakota are named from them, parts of Minnesota, Wisconsin, Iowa, Nebraska, Kansas, Missouri, Arkansas, Indian Territory), with outlying branches in Manitoba (Assiniboins), and isolated colonies in Alabama (Biloxi), the borders of Virginia and North Carolina (Tutelo), and, according to some authorities, in both Carolinas (Catawba). Being essentially a hunting people, the Dakotas were at no time very numerous, though necessarily spread over a wide range; and they are now (1892) reduced to probably less than 45,000, of whom 20,000 are in the South Dakota reserves, 7,000 in North Dakota, the rest in Nebraska, Minnesota, Wisconsin, and Canada. The Dakotas, *i.e.* "Leagued"

or "Allied," when first known to the whites, were constituted in a confederacy of seven nations forming the "Seven Great Council Fires," of which the more important surviving bands are the *Yanktons* and *Yanktonais*, *i.e.* "at the end," in reference to the remote position of their villages; *Sihasapa*, or Blackfeet, different from the Canadian Blackfeet, who are Algonquians; *Ohenonpa*, or Two Kettles; *Itazipteo*, the Sans Arc, or "Bowless," of the Franco-Canadians; *Minnecongie*, "Planters by the Water"; *Sitconju*, *i.e.* Brulés, or "Burnt Hips"; *Santee*, properly *Isanti*, *i.e.* "Knife People," so called from the material found in their territory from which stone knives were made, included the *Wahpeton*, or "Forest Men," and the *Sisseton*, or "Prairie Marsh Men"; *Ogalala* (*Oglala*), of unknown meaning; *Unkpapa*, most warlike and most powerful of all the "Allied." Frequent mention is also made of a "Titon" tribe; but this appears to be merely a collective name for all the prairie bands as opposed to those of the woodlands, from a root *tintan*, "treeless land." Since the rupture of the league and the restriction of all the bands to the various reserves, many, and especially the Yanktons, have adapted themselves to a settled life, and even made considerable progress in agriculture. But all have suffered much from the fraudulent dealings of the Government agents, and in 1891 were reduced to such distress that they were with difficulty prevented from leaving the reserves and joining in a general revolt. Physically and mentally, the Dakotas can scarcely be distinguished from the Red Skins; but their speech, which presents some remarkable peculiarities, differs radically from all others, forming one of the most widely diffused stock languages of the American continent. The phonetic system is marked by strong aspiration, extensive nasalisation, the absence of true diphthongs and of the letters *f*, *r*, *l*; there is no grammatical gender, nor even any element distinctive of sex; the noun has no inflection beyond two or three locative endings; the adjective has no degrees of comparison; and the plural element *pi*, common both to noun, verb, and pronoun, is of extremely limited use, being entirely restricted to men, as if the number of warriors alone were worthy of notice. (See *Annual Report of the Bureau of Ethnology* for 1882-83, Washington, 1886; Gabelentz, *Gram. Dakota*; D. C. Poole, *Among the Sioux of Dakota*, etc., New York, 1881; J. C. Pilling, *Bibliography of the Siouan Language*, Bureau of Ethnology, Washington, 1887.)

Dalberg, the name of an ancient noble German family, which has produced many men of historical note, and whose chief was the hereditary chamberlain of the Archbishop of Worms. A Dalberg, Archbishop of Cologne, crowned Henry II. in 1002. The male branch came to an end in the 12th century, but the heiress Margaret gave the name to her husband, and founded a new branch. Among princes, poets, and statesmen, one of the most noted members was Charles Theodore (1744–1817), who was Archbishop of Mainz, arch-chancellor of the Empire, prince-primate of the Confederation of the Rhine, and Grand-Duke of Frankfort.

Dale, Robert William (b. 1829), an independent minister of Birmingham, who is well known as taking a prominent part in local politics. He was born in London, and graduated as M.A. of London University in 1853. In the same year he joined the ministry, and was appointed to the Carr's Lane Congregational chapel in Birmingham, where he was the colleague of John Angell James, whom he succeeded in the chief pastorate. In 1868–9 he was chairman of the Congregational Union of England and Wales, and for seven years he edited the *Congregationalist*. Among his numerous writings were articles in reviews and magazines, and he also edited a translation of Reuss on the *Theology of the Apostolic Age*. In 1877 he lectured upon preaching at Yale College, Connecticut, U.S.A., and received from that body the degree of D.D., becoming also LL.D. of Glasgow in 1883. He was for a time vice-chairman of the Birmingham school board, and in 1886 he was a member of the Royal Commission upon the Elementary Education Acts. He is a governor of Birmingham grammar school.

D'Alembert, Jean (1717–1783)—called "Le Rond," from the circumstance of his being abandoned when an infant upon the steps of the church of St. Jean-le-Rond—a French writer and mathematician, born in Paris. His father, who abandoned him, provided for his education, and he was put under the care of a foster-mother, for whom he always maintained a great affection. From 12 to 17 he was educated at the "Collège Mazarin," and, after reading law, he was admitted advocate in 1738. But his bent was to geometry. In 1739–40 he contributed papers to the Academy of Science, of which he became a member in 1741. In 1744 he wrote upon the *Equilibrium and Movement of Fluids*, in 1746 upon the *General Cause of Winds*, thereby gaining a medal from the Academy of Berlin, in 1749 upon the *Precession of the Equinoxes*, and in 1752 upon the *Resistances of Fluids*. From 1751 to 1772 he was associated with Diderot in producing the *Encyclopædia*, for which he wrote a memorable preface (a table of human knowledge), and conducted generally the mathematical and physical as well as some of the literary and philosophical articles. In 1759 he published *Elements of Philosophy*. He was a sceptic in philosophy, but his views were marked by much discretion. In 1772 he became perpetual secretary of the Academy. He was a friend of Voltaire, and a voluminous correspondence commemorates this friendship. Both Frederick of Prussia and Catherine of Russia made overtures to him, but he was not ambitious of distinction.

D'Alembert's Principle, in dynamics of systems of particles, is that the external forces on any system are equivalent to the mass-accelerations produced, the internal forces of the system being in that connection negligible. It is, in fact, a statement that the observed external causes are equivalent, as a whole, to the observed effects produced. By its use generalised methods for solution of innumerable problems are obtained. [Dynamics.]

Dalhousie, James Andrew Brown Ramsay,

MARQUIS OF (1812–1860), a noted Governor-General of India. The son of the Earl of Dalhousie, he was educated at Harrow and Christ Church, and, having become by courtesy Lord Ramsay in 1832 owing to the death of his elder brother, he entered Parliament as member for Haddingtonshire in 1837. In 1838 his father's death advanced him to the House of Peers. In 1843 he was Vice-President of the Board of Trade in Sir Robert Peel's government, and in 1845 President. In 1846 Lord John Russell succeeded to the government, and asked him to stay on in office. In 1847 he was Governor-General of India. In this office he displayed great power in acquiring territory and in developing the resources of the empire. Under his auspices Pegu and the Punjab were conquered, and Oudh with many other states annexed. He did much for trade, agriculture, forestry, and mining, encouraged railways, telegraphs, roads, and canals, reorganised the postal service, established irrigation works, formed a Legislative Council, and introduced the principle of competition in the Civil Service. He also tried to put down suttee, infanticide, and thuggee. One of his greatest works was the cutting of the Ganges Canal. In 1856 the state of his health forced him to resign. He had already in 1849 received the thanks of Parliament and of the East India Company, and been created Marquis, and in 1852 made Lord Warden of the Cinque Ports. He took no further part in public life, and as he left no male issue the marquisate died with him. It is a question sometimes raised whether his vigorous policy was not one of the causes of the Sepoy mutiny and general revolt.

Dalkeith, a Scottish town upon a spit of land caused by the confluence of the N. and S. Esk to form the Esk, 6 miles S.E. of Edinburgh, in the county of Mid-Lothian. It is a great centre of the Scottish corn trade, and has mills, foundries, breweries, and tanneries. At the old church Dr. Norman Macleod was pastor for three years. Here is also the palace of the Duke of Buccleuch, where used to reside the Regent Morton, who sold the palace to the then Duke of Buccleuch. Charles Edward spent two days here after the battle of Preston Pans, and George IV. and Queen Victoria have each visited it. The present palace was built in 1700 for the widow of the Duke of Monmouth.

Dallas, the capital of Dallas county, Texas, U.S., on the left bank of Trinity river, 265 miles N.W. of Houston. It has colleges, flour-mills, foundries, and the like, and there are manufactures of woollen goods and soap among other things.

Dalmannia, a genus of Trilobites belonging to the family *Phacopidæ*, found in the Silurian and Devonian systems. The best known English species is *Dalmannia longicaudata*, from the Upper Silurian. The genus differs from *Phacops*—the type of the family—by its pointed "free cheeks" (the hinder outer angles of the head) and the sharp tail-like spine on the "pygidium," the hindmost division of the body.

Dalmatia, an Austrian territory lying along the Adriatic Sea, and having on the N. Croatia, on the S. Montenegro and the sea, on the E. Bosnia and Herzegovina, and on the W. the sea. It contains 4,940 square miles with a population of 510,372. The coast is steep and rocky, and is studded with picturesque islands and bays. Inland are mountains and moors, with streams and lakes which dry up in the summer. Parallel chains from the spurs of the Julian and Dinaric Alps traverse the country, and rise to a height of 6,000 feet. Half the land is in pasture, and there is some good ship timber. Wine, oil, brandy, hides, wool, wax, honey and fruit are among the products of the district. The climate is uncertain, with an average temperature of 60° and a rainfall of 28 ins. The inhabitants are good sailors and fishermen, but do not care much for agricultural pursuits. The Dalmatians were subdued by Augustus, and then fell successively into the hands of the Goths, Avars, and Slavs. In the 11th century the country was partly Hungarian and partly under Venetian protection. After other vicissitudes it finally was assigned to Austria in 1814. The present inhabitants of Dalmatia are almost exclusively Slavs of the Serbo-Croatian branch, who occupied this region about the year 620, after expelling and partly absorbing the Avars, themselves intruders since the close of the fifth century. These had been preceded by the Goths (Mœso-Goths), who had occupied the country after the fall of the Western Empire, reducing and apparently imposing their language on the original Illyrian populations. The Slavs retained their political independence till the beginning of the eleventh century, when Dalmatia was dismembered, one section being conquered by Ladislaus, King of Hungary, while the rest accepted the protection of Venice against the Turks. In consequence of these historical vicissitudes the peoples of the coastlands (Venetian Dalmatia) have been gradually Italianised, and Italian is now universally current along the seaboard from Istria to Montenegro. But the Morlaks, as the inhabitants of Upper Dalmatia are called, still retain their Servian speech, and are regarded as pure Slavs, though really a mixture of Slavs, Goths, Avars, and Albanians (Illyrians). The Morlak peasantry are amongst the rudest peoples of Europe, though physically a fine race, tall and shapely, betraying their diverse descent in the occurrence of blue eyes and fair complexion in association with dark or olive skins and chestnut hair. Of the present population (528,000 in 1890), about 430,000 are Roman Catholics of the Latin rite, all the rest Orthodox Greek, except a few hundred United Greeks and Jews. (*See* Ch. Yriarte, *L'Istrie et la Dalmatie* in *Tour du Monde*, xxix., 1874; A. Schmidt, *Das Königreich Dalmatien*, Stuttgart, 1842; J. Gardner Wilkinson, *Dalmatia and Montenegro*, London, 1848; A. Paton, *Highlands and Islands of the Adriatic*, London, 1849.)

Dalmatian Dog. [CARRIAGE DOG.]

Dalmatic, an ecclesiastical vestment somewhat like a surplice, but more richly embroidered, longer, and with round instead of pointed sleeves.

It seems to have been first worn in Dalmatia, whence the name, and is mentioned as existing as early as A.D. 250. It was sometimes worn by mediæval kings at their coronation, and Edward I. was buried in one of red silk. In the Anglican ritual it is the special vestment of the assistant ministers in the Holy Communion.

Dalriada, the name of an old Irish territory now forming the northern part of the county of Antrim. It was inhabited by a colony of Gaelic Scots who dwelt among the Picts. In 498 some of them migrated to Argyll, and founded another Dalriada. In 843 Kenneth MacAlpin united Scots and Picts, and founded the kingdom of Albyn or Scotland.

Dalrymple, ALEXANDER (1737–1808), was born near Edinburgh. At the age of sixteen he entered the East India Company's service, and getting on in it he was in 1759 employed to explore the Eastern Archipelago, and in 1764 to open up trade with China. In 1775 he was in the Council of Madras, and in 1779 he was appointed hydrographer to the Company, and from 1795-1808 to a similar post under the Admiralty. He appears to have been at the least eccentric, and having an idea that there existed an Antarctic continent, he proposed to the Government an exploration on condition that he should have for a term of years possession of the lands that he might discover. He produced some good maps, and interesting works.

Dalton, JOHN (1766–1844), physicist and chemist, was born at Manchester of a Quaker family. Educated in Manchester till fifteen years old, he was then sent to Kendal to a school kept by a relative. In 1788 he began his observations in meteorology, besides turning his attention to botany and other scientific subjects. In 1793 he was appointed Professor of Mathematics and Physics at Manchester New College. In 1794 he made researches into the nature of colour blindness, from which he suffered. In 1799 and the following years he supported himself by private tuition and lecturing. He was a member of the Royal Society, and associate of the Academy of Paris. In 1833 he received a pension, and a statue was erected to him in Manchester. Among his works were *Meteorological Observations* (1793), and a *New System of Chemical Philosophy* (1808–1810). As a physicist he is chiefly noted for his researches into the properties of elastic fluids, and his exposition of the specific weights of gas, and as a chemist for his elaboration of the atomic theory (q.v.), and his study of gases. A biographer has said of him that he possessed "virtue without ostentation, and religion without fanaticism."

Dalton-in-Furness, a town of Lancashire 16 miles N.W. of Lancaster, united by a canal of $3\frac{1}{2}$ miles to the Irish Sea. It possesses malteries and iron-works. Near it are the ruins of Furness Abbey.

Daltonism. [COLOUR BLINDNESS.]

Dalzell, THOMAS (1599–1685), born at Binns, Linlithgow. In 1650 he was a general of infantry, and being an ardent Royalist he was forced to leave the country during the Commonwealth, and took service with the Russians against the Tartars and Turks. In 1666 he was commander-in-chief in Scotland, and distinguished himself by his cruelty to the Covenanters, introducing methods of dealing which he had learned in foreign service, like Colonel Kirke a few years later.

Dam, in *Civil Engineering*, is a structure erected to prevent the flow of water from one level to another, or to regulate this flow. Weirs and coffer-dams are treated separately, and this article confines itself to the important class of structures known as masonry-dams and earth embankments. In the formation of a reservoir for the storage of water a spot is frequently chosen where the disposition of the ground is such that by building a masonry or earthen embankment of comparatively short length a large basin may be enclosed for the reception of water. Earthen embankments are much employed in India, where they are made of clay soil well watered and trampled down. The water side is built at a much steeper angle than the outer face, and is generally protected by a bed of puddle or small stone. The danger is lest the water should leak through the embankment, undermine its foundations, and carry it away. Masonry dams can only be constructed on rock foundations, but are much to be preferred. They may be built to great heights, the Furens dam in America being 200 feet high, the proposed Quaker-bridge dam 250 feet high, and the Vyrnwy dam 100 feet above ground, with 60 feet of foundation. The slopes on each side are steeper than in the case of earthworks, steeper on the water side than on the outer face. The shape of section is carefully designed, so that every layer of stone is of sufficient dimensions to withstand the weight of masonry above it and the possible pressure of water on that masonry; the resultant pressure on any such layer should pass through its middle third both when the reservoir is empty and when full. The overflow from the reservoir is carried off over a waste-weir. It is of much importance that the waste-weir should be adequate at all times.

Damage feasant is where a stranger's beasts are found on another person's land without leave or licence. A man is answerable not only for his own trespass, but for that of his cattle also; for if by his negligent keeping they stray upon the land of another (and much more if he permits or drives them on), and they there tread down his neighbour's hedge, or spoil his corn or his trees, this is a trespass for which the owner must answer in damages. And the law gives the party injured a double remedy in this case by permitting him to distrain the cattle, thus *damage feasant*, or doing damage, till the owner shall make him satisfaction, or else by leaving him to his remedy by action.

Damages, a sum of money awarded to be paid by one person to another as compensation for loss sustained by the latter in consequence of an injury or injuries committed or suffered by the former. The test by which the amount is arrived at is known as the measure of damages. Thus, where a

vendor sues his purchaser for breach of contract for the sale of goods, the measure of such damages should be the price of the goods if the property in them has passed to the purchaser, or the difference between the contract price and the market price at the time of the breach if the vendor has re-sold the goods. *Liquidated* damages are a sum agreed on between the parties, to be paid in case of a breach occurring, in order to save the costs and trouble of ascertaining the damage actually sustained. *Nominal* damages (such as a farthing) show that in the opinion of the court no real damage has been sustained, though a right may have been established. *Exemplary* damages consist not only of pecuniary compensation, but as a sort of punishment of the defendant with the view of preventing similar wrongs in future. *Consequential* damages are those losses or injuries which follow an act, but are not direct and immediate upon it. Courts of Equity have long laboured under the disadvantage of not being able to award damages for fraud or non-performance of contract. This was remedied by "Lord Cairns' Act," passed in the present reign, which gave jurisdiction to the court to award damages in addition to the equitable relief sought, and though that Act has been itself since repealed, it was in substance re-enacted by the Judicature Act, 1873. The "General Riot Damages Act," 1886, provides compensation out of the police rate to any person sustaining damage by riot. A serious riot which occurred in London in February, 1886, after a Socialist meeting in Trafalgar Square, led first of all to provision for this state of things, applicable to the metropolis only. This was quickly followed by the above Act. In former times compensation was recoverable from the "hundredors," from whom the liability has now been transferred as above. [HUNDRED.]

Daman. [HYRAX.]

Daman, a coast territory of Portuguese India in the province of Gujerat, and about 100 miles N. of Bombay. It contains 82 square miles, and has a population of 49,000. The country is fertile, and the teak forests produce abundance of timber well fitted for ship-building, and the climate is healthy, but in the wet season the country is inundated. It is watered by the Daman-Ganga, which rises in the Western Ghauts, and the port at the mouth of this river is rendered well-nigh inaccessible by a bar. Once the district had prosperous weaving and dyeing works, and did much trade in opium, but the introduction of Manchester goods has displaced the former of these industries, and the policy of the Government has destroyed the third. Now the principal pursuit is deep-sea fishing.

Daman-i-Koh, a hilly native conservation in Bengal, extending over 1,366 square miles, and having a population of 353,413.

Damaraland, a district of varied desert, mountain, and pasture-land of South Africa, bordering upon Namaqualand and stretching from the Atlantic to long. 19° 45′ E. The coast, which is waterless, is now part of the German protectorate, and on it is Walfisch Bay, which was annexed by Cape Colony in 1884. The pasture land, which extends to the mountains, whose greatest height is 8,500 feet, is fertilised by a good rainfall. The district produces feathers, ivory, and skins.

Damaras (properly DAMAQUA), the inhabitants of Damara or Herero Land, south-west coast of Africa, which for ages has been a debatable region between the Bantu and Hottentot races, the former advancing from the north (Obampoland), the latter slowly retreating southwards on the low-lying coastlands, and holding their ground in the uplands of the interior. Hence the twofold division of the present population into "Hill Damaras" of the Kaoko highlands, who are of Hottentot speech but of mixed Hottentot-Bantu descent, and "Cattle Damaras" or "Damaras of the Plains" who are pure Bantus, and whose proper name is Ova-Herero, the Merry People. These reached their present homes about 200 years ago from the region beyond the Cunene river, passing southwards between Obampoland on the coast to the Kaoko Hills, and here ramifying into two branches —the Ova-Mbandem, who went eastwards in the direction of Lake Ngami, and the Ova-Herero proper, who penetrated southwards nearly to Walfisch Bay. Here they came into collision with the Hau-Khoin, or "True Hottentots" of the hills, and the warfare thus begun between the two races has been carried on almost incessantly ever since. The Ova-Herero, physically a finer people even than the kindred Ova-Mpo, are essentially a pastoral nation divided into numerous tribes or castes (*eanda*), whose headmen acknowledge the authority of the paramount chief of Damaraland. They have long been in close contact with the whites, and many have been evangelised, especially by German and Finnish missionaries, though they still practise certain pagan rites connected with nature-worship. Like their cattle they show a strange dislike of salt. Chief Ova-Herero tribes: Kamaherero, Therawa, Kaoingava, Kambazembi, Kamwati, Kandjü, Omugunda, Ova-Mbanderu, Kukuri, Ova-Tyimba, with total population (1891), 92,000. (*See* Francis Galton, *Narrative of an Explorer in Tropical South Africa*, 1853; M. Andersson, *Tales of Travels in South Africa*, London, 1875; and *Peterman's Mitterlungen*, 1885–91.)

Damascening is a term given to the process of producing a variegated appearance on the surface of steel by combining it irregularly with iron and by subsequent treatment of the surface with acid. The word is also used to denote the Indian Kuft-work, in which gold and silver wire is inlaid in the surface of the metal.

Damascus, the capital of Syria, is one of the most interesting cities of the world, both by reason of its antiquity and the part it has played in sacred history and for its pleasant situation and surroundings, which present a striking contrast to the rugged barrenness of the neighbouring districts. It is situated in a plain of 200 square miles, studded with towns and villages, having the chain of Anti-Libanus on the N.W., the Black Mountains on the S., and extensive marshes on the

E. The city is on the W. side of the plain, at an elevation of 2,260 feet, and near to a spur of Anti-Libanus, which rises to 3,840 feet. The river Abana or Barada—well known in connection with Naaman the Syrian—supplies the city with abundance of the purest water, which is distributed by a great network of canals. An area of 60 miles is covered with orchards, gardens, vineyards and fields. The old walled city lies to the S. of the river, and the "street which is called Straight" still separates the Jewish quarter on the S. from the Christian quarter on the N. On the W. is the 13th century citadel, and the 8th century mosque occupies the site of an ancient Christian church which usurped the place of a still older temple. Traces of the former are still to be found in the architecture and materials of the mosque. Damascus is still an emporium of overland trade, and its busy bazaars form an important and interesting feature. The mosque contains the reputed shrine of St. John the Baptist, and some valuable MSS. which are highly treasured, and one of its lofty minarets is called the "Jesus" minaret, and is said by tradition to be the point where Christ will appear to judge the world. The remains of ancient barbaric civilisation are everywhere to be seen side by side with the tokens of modern civilised barbarism. The population of 150,000 is mostly Mohammedan. The ancient city was devastated by Tamerlane, and at a later period by the Turks, becoming Mohammedan in 634. Until 1832 the Jews and the Christians were subject to many disabilities, and the great massacre of 1860 did much to undo the work of the most industrious part of the population. There is still some manufacture of silks and woollens, but the old industry of cutlery for which Damascus was famed seems to have died out. Sir Richard Burton delighted in Damascus, and his fame still survives there.

Damasus, ST. (306–384), became in 366 the thirty-ninth Pope. He was a great opponent of the Arians, and a fight and extensive slaughter of the combatants in a church marked the beginning of his reign. He encouraged St. Jerome to make the translation of the Scriptures known as the Vulgate, and he did much towards preserving and beautifying the Catacombs. One of his chief works was to check the seeking after gifts by the clergy, thus anticipating the statutes of mortmain, and the evidence of St. Jerome goes to show that there was great need of his reforms. He left Letters, and other literary works behind him.

Damiani, PIETRO (1007–1072), an ecclesiastic who, born at Ravenna, rose from being a swineherd to the dignity of Cardinal and Bishop of Ostia in 1057. He was a great supporter of Hildebrand (Gregory VII., q.v.), by whom he was employed on many important missions. Among his writings are many Letters and Speeches.

Damien de Veuster, better known as Father Damien, a Belgian priest, hearing during his ministration at Honolulu of the deserted and wretched condition of the Hawaiian lepers on the island of Molokai, generously determined to court almost certain death in the alleviation of their horrible sufferings. Entering on his mission in 1873, for twelve years he laboured faithfully among his flock, performing the most menial offices till stricken down in 1885. During the latter years of his ministration he received the assistance of another priest in his truly Christian work.

Damiens, ROBERT FRANCOIS, born near Arras in Artois, in France, in 1714, was forced to fly from Paris on charges of robbery and poisoning, and on his return found a quarrel in active progress between the Church and Parliament, in which the king was implicated. The motive of his crime, attributed by some to the Jesuits, by others to insanity, is uncertain, but as Louis XV., surrounded by his body-guard, was entering his carriage, he was stabbed by Damiens. The wretched man, after being horribly tortured, was torn to pieces by horses, and his family banished the country, 1757.

Damietta, a town and river-port of Lower Egypt, on the right bank of the eastern branch of the Nile, about 8 miles above its junction with the sea. The want of a good harbour and the commercial growth of Alexandria have impaired its prosperity, especially in its trade relations with European countries. Its exports consist chiefly of grain, fish, rice, coffee, dates, hides, and tallow. It is 113 miles N. by E. from Cairo by rail, and, though destitute of any remains of antiquity, contains several handsome buildings, including mosques, khans, cafés, and kiosks. The climate is considered salubrious.

Dammar, a series of copalline resins, hard, transparent, brittle, straw-coloured, and odourless when solid, soluble in ether, benzol, or chloroform. Much of that in commerce is the produce of *Dammara orientalis*, the Amboyna pine, a native of Java and the Moluccas, reaching 100 feet in height, and comes to us from Batavia and through Singapore, whence Britain imports 1,000 tons annually. *D. australis*, the Cowdie or Kauri pine of New Zealand, 150 to 200 feet high, yields a similar resin known as Kauri gum, worth £6 to £10 per cwt., as also do *D. ovata*, *D. Cookii*, *D. lanceolata*, of New Caledonia, *D. robusta*, of Queensland, and *D. viticnsis*, of Fiji. In New Zealand this resin is also found fossil. In India several similar resins, little known in western commerce, are known as dammar. They are used as incense; but with us are valued for varnish-making. White dammar, or Piney varnish, is the produce of *Vateria indica* and *V. acuminata;* black dammar, of *Canarium strictum;* Sal dammar, of *Shorea robusta;* and Rock dammar, of *Hopea micrantha.*

Damocles, a courtier, companion, and parasite of the elder Dionysius, tyrant of Syracuse, who, having grossly flattered the monarch on one occasion, found at a magnificent banquet subsequently given in his honour a sword suspended above him by a single hair. The tyrant thus reminded him that "uneasy lies the head that wears a crown."

Damodar, or DAMMOODAH, a river of India, whose valleys abound in iron and coal, rises in the district of Lohardaga, presidency of Bengal, and,

after a southerly course of 350 miles, empties itself into the Hooghly. It has numerous tributaries, and is navigable for a considerable distance for large vessels.

Damoh, or DUMOH, a hilly district of the Jabalpur division, Central Provinces, British India, area 2,799 square miles. Its capital of the same name lies 50 miles E. of Ságar. The district, which is on the Vindhya plateau, abounds in jungle.

Damon, a Pythagorean, and friend of Pythias or Phintias, who was condemned to death for plotting against Dionysius I. of Syracuse, but was granted time to settle his private affairs, on condition that Pythias would go bail with his life for the re-appearance of his friend. Damon returned just in time, and the tyrant, struck with astonishment at his devotion, spared his life.

Damper is a hinged valve in a chimney or flue to vary the draught that can pass through. It also means the arrangement to stop the vibration of the wire of a piano after the notes have been struck and the fingers removed.

Dampier, a county on the S.E. coast of New South Wales; capital, Uloruya.

Dampier, WILLIAM, English navigator and buccaneer, was born in 1652. While on a voyage in 1699–1701 to New Holland, he discovered the Archipelago of New Britain, the Dampier Archipelago, and Dampier Strait. He made other voyages in 1705 and 1708–11. In 1698 he had been given a commission as commander in the navy. He wrote *A Voyage round the World*. He is supposed to have died in 1715.

Dampier Archipelago comprises numerous small islands off the N.W. coast of Australia, extending between long. 116° and 118° W. The largest of this rocky group.

Dampier's Land, a fertile peninsula on the north of Western Australia.

Dampier Strait. 1. Through this passage, having New Britain on the right and the S.W. coast of New Guinea on the left, lies the shortest route from Eastern Australia to China. 2. A channel, 70 miles long, in the North Pacific, between the island of Waygiou and the N.W. extremity of New Guinea.

Damping, in practical physics, is the diminution in the amplitude of the oscillations of a body by friction of some kind. In many electrical instruments it is necessary that the damping effect on the recording needle shall be vigorous and rapid; the needle quickly takes up its position of equilibrium and is said to be *dead-beat*. In other instruments we want the friction to be very slight and the decrement in amplitude to be small. In such cases the causes are removed that have a damping effect.

Damson, named from Damascus, whence it may have been originally introduced into Europe, is a variety of plum (*Prunus domestica*) with a small, oval, austere fruit, now often growing in a half-wild state. The fruit is made into tarts and into a preserve known as damson cheese. A yellow-fruited variety of the bullace (q.v.) is sold as "white damsons."

Dana, CHARLES ANDERSON, an American journalist, was born at Hinsdale, New Hampshire, in 1819, and graduated at Harvard. Becoming subsequently the manager of the *New York Tribune*, he strongly discountenanced in its pages the introduction of slavery into newly-acquired territories. In 1867 he edited the *New York Sun*, a democratic organ. From 1857 to 1863, in conjunction with a friend, he was engaged in organising and editing the *New American Encyclopædia*. Several translations have also been published by him.

Dana, JAMES DWIGHT, American naturalist, was born in Utica, New York State, in 1813, and after studying at Yale College, served, in 1838, on Wilkes' expedition of scientific exploration, a full account of which was subsequently published by him. In recognition of his services, in 1846, he was elected to the chair of natural history and geology in Yale College. His best known works are *Characteristics of Volcanoes with Facts from the Hawaiian Islands*, a *System of Mineralogy*, and a *Text-Book of Geology*.

Dana, RICHARD HENRY, poet, may be regarded as the father of American literature. Born at Cambridge, Massachusetts, in 1787, and educated at Harvard, he was called to the bar in 1811, but, abandoning law as a profession, in 1814, in conjunction with his friend Bryant, edited the *North American Review*, and in 1821, with Bryant and Allston, was joint proprietor of the *Idle Man*. In 1827 appeared his volume of poems, entitled the *Buccaneer and other Poems*, and in 1833 his *Collection of Prose and Verse*. He obtained considerable popularity as a lecturer, but, though a sound critic, his poetry does not reach a high standard. He died in 1879.

Dana, RICHARD HENRY, junr., son of Richard Henry Dana, the poet, was born in 1815 at Cambridge, Massachusetts, and made himself a reputation as lawyer and journalist, but more particularly as a novelist. In 1832, with the object of curing a weakness of his eyes, he was sent to sea in a sailing vessel that went from Boston to California. To this circumstance the world owes that delightful sea story *Two Years Before the Mast*, which first appeared in 1840. Mr. Dana also wrote *The Seaman's Friend* (1841), and *To Cuba and Back* (1859), as well as many legal works. He lived during his last years in Europe, and died at Rome in 1882.

Danaë, daughter of Acrisius, king of Argos, grandson of Danaus, was imprisoned by her father owing to an oracular response that she would be the mother of a child, the slayer of his grandfather. Visited by Zeus in prison amid a shower of gold, she eventually gave birth to a son, Perseus. Mother and son were thrown into the sea in a chest by Acrisius, and drifted to the island of Seriphos. Arrived at manhood, Perseus accompanied his mother to Argos, and subsequently, as foretold, Acrisius, through an accident, met with his death at the hands of his grandson at Larissa.

Danaus, ruler of Libya, son of Belus, and brother of Ægyptus, ruler of Arabia, suspecting that his brother had designs on his life, fled with his fifty daughters to Argos, where he was elected

king. He was soon followed by the fifty sons of Ægyptus as suitors for the hand of his daughters. Their offer was accepted, but on the marriage night, by order of Danaus, they were all slain by their brides, excepting the husband of Hypermnestra.

Danbury, a semi-capital of Fairfield county, Connecticut, U.S., about 30 miles W.N.W. of New Haven. The soil is generally fertile, and, besides several important public buildings, the town contains numerous hat manufactories and a sewing-machine factory.

Danby, Francis, A.R.A., a landscape painter, was born near Wexford, Ireland, in 1793, and, after pursuing his calling in Dublin, came to England in 1813, where he made a speciality of paintings lit up with the glow of sunset. His first work of pretension was his *Upas Tree of Java*, and at a later date his *Sunset at Sea after a Storm*, *Morning at Rhodes*, *Delivery of Israel out of Egypt*, and *Embarkation of Cleopatra on the Cydnus* gained him considerable notoriety. His death occurred at Exmouth, Devon, in 1861.

Dance, Sir Nathaniel, a distinguished seaman in the service of the East India Company, was born in London in 1748, and was grandson of George Dance, the City architect. He went to sea in 1759, and in 1804, being then commodore, he left Canton with a large fleet for Europe. On Feb. 15 he was attacked by Admiral Linois, with five ships of war; but after a smart action he drove off the immensely superior force of the enemy in a manner which earned him the honour of knighthood from the king, and from the Court of Directors 2,000 guineas and a piece of plate.

Dance of Death, or Danse Macabre, a sort of allegorical pageant representing Death's dealings with mankind, frequently represented in the sacred art of the Middle Ages. To the sacred dances customary in Pagan times [Dancing], as to other Pagan observances, the Church did its best to give a Christian significance. Masquerades of the kind seem to be alluded to by Walter de Mapes in the 11th century, and are stated on doubtful authority to have taken place in Paris in the 15th. At any rate they were frequently represented in a series of pictures, on church windows or on the walls of cloisters, especially in Dominican monasteries, and on bridges, especially in Germany and Switzerland, *e.g.* at Lucerne. The pictures are accompanied by descriptive and moral verses, which differ much in different places. Some of these have been ascribed to a Bohemian poet, Macaber, but there is no doubt that the name is merely a corruption of that of St. Macarius, who appears in some of the paintings as a hermit. There was a celebrated Dance of Death in Basel, which was destroyed in 1806. Forty-three examples are known to have existed in England alone. The dance is also depicted in some MSS. But the Dance of Death is best known from the forty-one admirable wood engravings attributed from internal evidence to Holbein (q.v.), published as a book at Lyons in 1538. Some, however, think them the work of a certain Hans Lutzenberger. They represent, however, not so much scenes in a dance as groups of various characters, among whom "the skeletonised Death, with all the animation of a living person, forms the most important personage —sometimes amusingly ludicrous, occasionally mischievous, but always busy and characteristically occupied." (Douce, *Dance of Death*, p. 82.)

Dancing, a natural expression of various emotions, found even among some species of birds. In mankind this natural movement early became specialised into expression of particular emotions, and accompanied with mimicry. Many savages work up their courage for battle by elaborate dancing and imitation of fighting. From an expression of feeling it naturally passes into one of desire, and then into a supposed means of attaining the end desired. Thus, when buffaloes were scarce, the Mandan Indians, who hunted them, "danced buffalo," *i.e.* dressed up as buffaloes and danced, pretending at times to fall as if shot, while others came forward and skinned them. In 1890–91 "ghost dancing," founded on misunderstood scraps of Christian teaching as to the Day of Judgment, was resorted to by the North American Indians to hasten the "restitution of all things," and nearly caused a general Indian revolt. "On the lower levels of culture," says Mr. Tylor, "men dance to express their feelings and wishes." Thus, dancing is commonly an act of worship, as in ancient Greece and Egypt and in the case of the Salii at Rome. Even King David danced before the Ark, and wherever under Christianity the control of emotion in worship has been much weakened, dancing has reappeared, as in the "dancing mania" of the Middle Ages, and with the Shakers of America. In Seville cathedral there is a periodical dance of choristers before the high altar, probably a survival of paganism. Greek and Roman civilisation tended to suppress the emotions, and non-religious dancing was left to professionals, usually slave girls. "Hardly any one dances when sober," says Cicero, "unless he is mad." In the later Middle Ages stately and formal dances, doubtless adopted from rustic survivals of the religious dances of pre-Christian Europe, were in vogue among high society, and continued so until the early part of this century. Chiefly owing to the contact of French officers with German and Russian society during Napoleon's wars, they were gradually expelled by the more rapid and exciting dances, of which the waltz is the type, and which were thought highly improper on their first introduction. [Gavotte, Minuet, Quadrille, Polka, Waltz.]

Dandelion (the English corruption of the French *dent de lion*, lion's tooth, so named from the tooth-like lobes of its leaves) is the popular name of *Taraxacum officinale*, a very common perennial weed in the northern hemisphere belonging to the sub-order *Cichoraceæ* of the order *Compositæ*. The black rhizome is roasted as a substitute for, or adulterant of, coffee, and the leaves, which form a rosette and are bitter when green, are, when blanched, an excellent salad. The peduncles of the numerous scapes are glabrous, hollow, and brittle. The

involucre consists of two whorls of green bracts, the outer reflexed and the inner spreading; all the florets are alike ligulate and bisexual with golden-yellow corollas, forming a head 1½ inches across. The common receptacle is flat and naked, but becomes rounded after flowering, so that the fruits, which are each surmounted by a stalked pilose pappus, form a white globe nearly 2 inches in diameter. The plant flowers from April to August, the heads only remaining expanded from about 5 a.m. to 9 p.m. The whole plant contains abundant milky latex, which coagulates on exposure, becoming a violet-brown. In contains caoutchouc and a diuretic principle, *taraxacin*. An infusion, decoction, and extract of the root-stock are employed medicinally as mild laxatives and tonics, acting especially on the liver.

Dandie Dinmont. [TERRIER.]

Dandolo, HENRICO, Doge of Venice, was elected to that office when in his 84th year, having previously been sent as ambassador to Constantinople in the year 1173, where he was imprisoned by order of the Emperor. On his return he prosecuted with energy the war with the Pisans, and in 1201 at their earnest request placed himself at the head of the Crusaders, and, after reducing Trieste and Zara, in 1203 captured Constantinople. On the murder of the Emperor Alexius the following year, he again laid siege to and carried that capital by storm, and established Count Baldwin on the throne. During his term of office, owing to his exceptional abilities both as a statesman and a general, the dominion of Venice was widely extended. He died in 1205.

Dandy Fever. [DENGUE.]

Danegeld, in English history, a tax on cultivated land first imposed, in 991 A.D., by Ethelred the Unready, on the advice of Archbishop Sigeric, to buy off the Danish invaders. (Much Anglo-Saxon coin of about this date has been found in Denmark and Sweden.) It was abolished by Edward the Confessor, having been continued long after it had ceased to serve its purpose. William the Conqueror re-imposed it, and tripled the amount in 1084. Stephen promised to abolish it. Henry II. did so in 1163, though he taxed the land as much under other names. Richard I. virtually revived it as carucage. It was probably the first money tax paid in England.

Danelagh, or DANELAGU, in English history, the part of England subject to Danish as distinct from that subject to Anglo-Saxon law and custom. By the treaty of Wedmore (879) between Alfred the Great and Guthrun, its boundaries were defined thus:—"From the mouth of the Thames to the Lea, up the Lea to its source, thence to Bedford, and along the Ouse to Watling Street." In its greatest extent, however, it may roughly be described as extending from the Thames to the Tees, and far enough west to include the counties of Bucks, Northampton, Leicester, and Notts. But the degree of Danish influence in different parts of this district varied considerably. In Yorkshire and Lindsey, in Lincolnshire, the land was divided into ridings or trithings and wapentakes (q.v.), the latter equivalent to the Saxon hundred; no trace of this division is found in East Anglia, and it was only partial in the Midlands. The evidence of local names (*e.g.* the endings *thorp*, *by*, and *caster*) shows that the Danish settlement was far more complete in Yorkshire and Lindsey than elsewhere. It is not clear what the precise difference between Danish and Anglo-Saxon law consisted in, and there was certainly a close resemblance between their leading features. The distinction, however, is recognised as late as the reign of Stephen.

Dángs, a district of the Bombay Presidency, with an area of 1,000 square miles. Timber abounds, but the rainfall is excessive, and the climate unhealthy. The country, which is surrounded by hills, is governed by native chiefs. The products, with the exception of timber, are unimportant. The Bhils rank first among the forest tribes, of which the population is composed.

Daniel, SAMUEL, English poet and historian, was born in Somerset in 1562, and, after studying at Oxford University, became tutor in several distinguished families, and devoted his leisure time to the composition of poetry and the compilation of his history. The close of his life was spent on a farm at Beckington. Though his sonnets are above the average, his poems generally, though not wanting in sweetness, are deficient in force and vitality. His best known works were a poem entitled *A History of the Civil Wars between York and Lancaster*, and his *History of England* down to the time of Edward III. He died in 1619.

Daniell, JOHN FREDERICK, D.C.L., chemist, was born in London in 1790, and, forsaking business for science, was elected F.R.S. in 1814, and in 1831 obtained the chair as chemical lecturer at King's College, a post occupied by him till his death, which occurred in 1845. In 1839 he was offered and accepted the foreign secretaryship to the Royal Society. He was the author of *Meteorological Essays*, an *Introduction to Chemical Philosophy*, and was the inventor of a hygrometer. He was, moreover, the first person to obtain the three medals in the gift of the Royal Society.

Daniell's Cell, in *Electricity*, was the earliest of two-fluid batteries, where the deposition of hydrogen on the positive plate was avoided by its transfer to a solution of copper sulphate, and a deposition of copper effected instead. In its simple form it consists of a copper plate dipped into a saturated solution of copper sulphate. A porous pot, containing a stick of zinc in dilute sulphuric acid, is placed in the copper solution. When the zinc and copper are joined by a conductor the zinc begins to dissolve in the acid, hydrogen is evolved by this action, it is handed through the porous pot to the copper sulphate, and by combining therewith forms sulphuric acid, and sets free copper which is deposited on the copper plate. Thus the one solution becomes less acid and the other one more so; the stick of zinc diminishes in size and the copper plate increases. [BATTERY, ELECTRICITY.]

Danites, or "destroying angels," were an organised band of Mormons intended to prevent the entry into the Mormon territory in Utah of other than Mormon immigrants. Shocking stories were told of the atrocious cruelties perpetrated by them on inoffensive non-Mormon immigrants. The worst of these—the massacre of 100 persons at Mountain Meadows Creek—was committed in 1857, but not punished till 1877, when a leading Mormon, John D. Lee, was convicted of participation in it and shot. The opening of the Pacific Railway made such attempted prevention hopeless. [MORMONISM.]

Dankâli (plural *Danâkil*), a large nomad people of north-east Africa, whose domain comprises all the low-lying coastlands between Abyssinia and the Red Sea, and extending from the neighbourhood of Massawa southwards to the Strait of Babel-Mandeb and Tajura Bay, a total area of about 35,000 square miles. The *Afars*, as they call themselves, Dankâli being their Arab name, are not negroes, despite their dark complexion, but are akin to their northern neighbours the Bejas [BEJA], and to the Gallas and Somals on their southern frontier. Jointly with these and with some scattered groups in Abyssinia, they form the Eastern or Ethiopic Division of the Hamitic Family [HAMITIC RACE], which extend from about the equator along the seaboard north to Egypt. The Afars, like all nomad people, are divided into a great number of clans or family groups (wrongly called tribes), of whom over 150 have been enumerated, all regarding themselves as equally independent under their several "Ras," or secondary chiefs, while recognising the suzerainty of three great chiefs, or "Sultans," residing at Tajura, Aussa, and Rahhita. The best known tribal divisions going southwards are the Saho, Haddarem, Dahimela, Dumheito, Dodo Hurtu (Taltal), Dawaro, Modaito, and Adaïl, this last being the name commonly applied to the whole nation by the Abyssinians. In time of war the western tribes form a confederacy under the name of Debeni-Vehema, which has hitherto been strong enough to defend the national liberties from the Abyssinians pressing them on the west, and the Italians advancing from the sea coast. They are a fierce, warlike people, of splendid physique, tall, slim and agile, of a deep bronze or even black colour, with black, kinky hair, straight nose, and regular European features, which reminded Dr. Kirk of Flaxman's finest models. The national weapons are the spear, cutlass, and ox-hide shield, for which firearms have in recent years been largely substituted. The east tribes are all fanatical Mohammedans, those of the interior much more lax, some being even still pagans or else half Christians of the Abyssinian sect. They have developed no industries, their sole pursuit being stock-breeding (camels and cattle), and the escort of caravans between the coast and the foot of the Abyssinian plateau. All the Afar tribes have been included politically in the Italian colony of Eritrea. (*See* Dr. R. Kirk. *Journey from Tajoorah to Ankober*, Transactions of Bombay Geographical Society, vol. vi. p. 317; C. Harris, *The Highlands of Ethiopia*, London, 1844; W. Munziger, *Journey through the Afar Country*, Journal Royal Geographical Society, vol. xxxix.

Danneker, JOHANN HEINRICH, a German sculptor, was born at Stuttgardt in 1758, and studied at Ludwigsburg, Paris, and finally Rome, where he had the good fortune to form the acquaintance of Canova, Goethe, and Herder. On his return to Germany he was in 1790 created professor of sculpture in the Academy of Stuttgardt by the Duke of Wurtemburg. His female busts are especially deserving of praise, as well as his *Christ*, *Faith*, *Ariadne on the Leopard*, and his busts of Schiller, Gluck, and others. He died in 1841.

Dante Alighieri, Florentine poet, was born at Florence in May, 1265. The name Dante is a familiar abbreviation of *Durante* (as we have Bice for Beatrice); and the surname Alighieri, or Aldighieri, seems to have come into the family, who were originally Elisei, with the poet's great-great-grandmother, who belonged to Ferrara. Between her time and that of Dante two of the line—one of them Dante's father—were christened Aldighiero; and the name seems to have been the accepted patronymic when he was born. The family belonged to the *popolani* or burgher class, and like that class in general to the *Guelf* party. To explain this term shortly, it should be stated that during the 13th century Central Italy possessed no central government, but was divided into a number of small states, each depending on some city, all independent of, and generally at war with, each other. All recognised more or less the overlordship of the Roman Emperor, who at that time was usually a German by birth; but in practice they took very little heed of him, while the Popes of Rome, being close by, could exercise a more constant influence. Consequently two great parties came into existence, taking their names from those of certain German families, which in a former struggle for the Imperial Crown had been used as party cries. For Italy the origin of their names was forgotten. The Guelfs represented the cause of municipal independence and, therefore, of the retention of the division into small communities; the Ghibelines, who comprised most of the noble families—these being largely of Teutonic origin—supported the imperial authority and so far the unity of Italy. For the most part the Popes favoured the Guelfs, and these again, in their hostility to the empire, were largely responsible for the interference of the French in Italian affairs. At the time of Dante's birth the Ghibelines had for the moment the upper hand at Florence, and the leading Guelfs were in exile, but before long the victories of Charles of Anjou over the last scions of the Hohenstaufen family, Manfred and Conradin, broke down the Ghibeline power practically for ever. In 1273 they returned for a few years, but in 1275 they were finally banished; and from that time Florence was the mainstay of the Guelf party. In so restless a population, however, new divisions were sure to manifest themselves. In 1300 a quarrel, having its origin in a family feud at Pistoia, was transferred to Florence, and the Guelfs were divided into two parties, known as

"Blacks" and "Whites." These were headed respectively by the families of the Donati and the Cerchi. The former, representing the old Florentine burgher blood, had now grown into an overbearing aristocracy, while the latter, originally immigrants from the country districts, were more or less the popular party. Party feeling rose to a high pitch, and encounters took place in the streets. At length Pope Boniface VIII. intervened, and sent for the leaders to Rome. Vieri de' Cerchi, the chief of the White party, treated the matter contemptuously, and set the Pope against him. Boniface then sent Cardinal d'Acquasparta to Florence as mediator, but with no result. From June to August, 1301, Dante was one of the seven "Priors," who were elected every two months to act as the governing body of the republic; and in that capacity he took a share in the opposition to Boniface. In the following year Charles of Valois, brother of the King of France, was called in by the Pope to act the part of "pacificator" in Tuscany. He took the side of the Blacks, and the Whites, including Dante, were banished. After this they made common cause with the Ghibelines, and were finally merged in that party. Several attempts to return by force of arms were defeated, and Dante never entered his native city again.

After this digression, rendered necessary in order to show Dante's position with reference to the politics of his time, we can revert to the story of his life, so far as it is known. Several biographies of him were written in the course of the fourteenth and fifteenth centuries; but even the earliest of these, written by Boccaccio within fifty years after Dante's death, cannot be taken as a very trustworthy authority, and others are of even less value. From the poet's own writings we know the date of his birth as already given, and that at the age of nine he met at a gathering of children a little girl one year younger than himself, who exercised a strange attraction upon him. He did not see her again for nine years, and then became deeply enamoured of her. It does not appear that they ever had more than the most distant acquaintance; and in due course she married another man, and died when Dante was twenty-five. A few years later he himself married Gemma Donati, by whom he had a large family. At the same time he represents himself as utterly overwhelmed by the loss of his early love, treating it, indeed, as a national calamity. Of her name he only tells us that it was Beatrice; but she was very early identified with the daughter of a Florentine gentleman, Folco Portinari, and the wife of Simone de Bardi. Some modern critics, indeed, have supposed that she is purely an abstraction. But no one is likely to take this view who is acquainted with mediæval methods of expression and mediæval amatory literature; nor, indeed, is it at all probable that Boccaccio, who must have spoken with many persons to whom the circumstances were known, should have made a mistake. Of Dante's life before his exile we know, besides what has been stated above, very little. He took his share in civic and military duties; he may have been present at the battle of Campaldino between the Florentine Guelfs and the Ghibelines of Arezzo in 1289, when the latter were defeated; and he tells us himself that he was present when the fortress of Caprona was surrendered by the Pisans in the same year to a mixed force of Florentines and Lucchese. At the age of thirty he took a step required by the constitution of Florence from every citizen who wished to take a share in the government, by joining one of the seven "greater arts" or guilds. The one selected by him was that of the apothecaries or medical men. It is said that the trade in manuscript books was in the hands of this guild, which probably determined Dante's choice. There is documentary evidence of his having been a member of the Council of the *Podestà* or chief magistrate and of other bodies of the same kind; and, as we have seen, in 1300 he served the office of Prior. All this time he must have been studying with vast diligence. In his knowledge both of literature and of science, moral and physical, he was surpassed by none of his contemporaries. "A great man of letters was he in almost every science, for all that he was a layman," says the historian John Villani, who knew him personally. His bent for study seems to have been encouraged by the famous Florentine *savant* and statesman, Brunetto Latini, who was an old man when Dante was a lad, but there is no evidence to show that he was ever, in the ordinary sense, Dante's tutor, as is often asserted.

After his banishment Dante visited for purposes of study Bologna and Paris, "and more parts of the world," says Villani. Some writers have imagined that England was among them, and that he visited Oxford. Of this it can only be said that we do not know that he did not. The only evidence for it is found in some Latin verses of Boccaccio's, where the words "visit *extremos Britannos*" are as likely as not to be a poetical exaggeration. Mainly, however, his time was spent in wandering about Italy. He was for a time at Verona, under the protection of the great family of La Scala; and we can trace him elsewhere by scraps of evidence from legal documents in which his name appears as that of a party or a witness. Thus we know that he was in Padua in August, 1306; and that later in the same year he went to the Marquis Malaspina in the Lunigiana, or country north-west of Pisa. His journey to Paris probably came after this. But his wanderings were cut short by the arrival, in 1310, of the newly-elected emperor, Henry of Luxemburg, in Italy, and Dante with other exiles hastened to join him. Shortly afterwards he addressed, from the confines of Tuscany "near the head-waters of the Arno," a letter to his fellow-citizens, full of taunts and reproaches, which they answered by renewing the sentence of banishment; and another to the emperor, urging him on to the task of subduing the city. Henry, however, passed Florence, and went on to Rome, where he was crowned by Cardinal Fieschi (the Pope was of course at Avignon) in June, 1312. On his return he besieged Florence for a month, withdrew to Pisa, and moved south in the next summer to attack the kingdom of Naples, which was a stronghold of the

French party. At Siena he was taken ill, it was thought from poison, and died at Bonconvento August 24, 1313. With him the last hope of the Ghibeline cause vanished, and with it Dante's hopes of an universal empire. His successor, Lewis the Bavarian, kept up the struggle a little longer; but from that time the empire became more and more a German sovereignty. Dante became again a wanderer. After Henry's death he is said to have withdrawn for a time to the monastery of Croce d'Avellana, near Agubbio. On the death of Clement V., in 1314, he wrote a letter addressed to the Italian cardinals, with the hope of inducing them to elect an Italian Pope and restore the Holy See to Rome. In the summer of the same year the Ghibeline cause looked for a moment prosperous, under the famous leader Uguccione della Faggiuola; and Dante hastened to join him at Lucca. In August, 1315, Uguccione defeated the Florentines heavily at Montecatini, but in the following spring he was himself driven out. About this time the Florentines offered to their banished citizens permission to return, but only on condition of their submitting to the humiliation of a public confession of misdoing. In a letter "to a Florentine friend" Dante rejects this offer indignantly. "Far from the man, whose comrade is philosophy," he says, "be this baseness, fit only for a heart of mire." His last home was found at Ravenna, where he was honourably received and protected for the rest of his life by Guido of Polenta, lord of that town and of Rimini. Once he went back to Verona, on a visit to Can Grande della Scala, son of his old protector, Bartolommeo. His last public service was rendered in 1321, when he went as ambassador from Ravenna to Venice on behalf of the lord of Polenta, who was threatened with war from his neighbour. He returned ill, and died at Ravenna in July (or September), 1321. His tomb is still to be seen there.

Dante is, of course, best known to posterity by his great poem, *La Commedia*. This was the title which he himself gave to it; a later age added the epithet *Divina*, by which it has since been known. His reasons for calling the work a "comedy" are strange to our notions. In a letter to Can Grande della Scala he explains (by the aid of some curious etymology) that a comedy is that which begins in gloom and squalor and ends happily. The poem itself, which was entirely written after his exile, records a journey which he represents himself as having made under the guidance first of Virgil, then of Beatrice, through the realms of the next world—Hell, Purgatory, and Paradise. Into this framework he not only fits a whole scheme of political and moral philosophy (often couched in the form of allegory) and theology, but also innumerable judgments upon his contemporaries, and, indeed, upon distinguished persons of all ages in the world's history. It is the first great work of Italian literature, and remains incomparably the greatest. Besides this, he wrote many odes and sonnets, some of extreme beauty. The best known of these are embodied in his early work, *The New (or Young) Life*, in which the story of his youthful passion for Beatrice is related in the mystical style of the time. Later he began *The Banquet*, a kind of prose summary of his ethical and social creed, in the form of a commentary on certain of his odes. Of the projected fourteen books only four were written, but these form a valuable aid to the study of the *Commedia*. In Latin he wrote a treatise, *Of Monarchy*, expounding his views as to the government of mankind, and maintaining his theory of the empire. It is a wonderful monument of scholastic argumentation. He also began, but did not complete, a work, *On the Vulgar Tongue*, an attempt to settle a common form of the Italian language, interesting as an early attempt at scientific philology; and an *Enquiry Concerning Land and Water* (of not quite certain authenticity), which purports to have been delivered at Verona in the year before his death.

Danton, GEORGE JACQUES, a French revolutionist, was born at Arcis-sur-Aube in 1759, and subsequently called to the bar, but, on the outbreak of the Revolution, threw up his profession, and became a leading spirit in the iconoclastic movement of the time. After founding the Club of Cordeliers in 1790, in conjunction with Marat and Desmoulins, in 1792 he became Minister of Justice, and from the tribune, stalwart in figure and powerful in lung, poured forth words of impassioned eloquence which roused the people to frenzy. He voted for the death of the king in 1793, and was mainly instrumental in the establishment of the Committee of Public Safety. He now turned his attention to crushing the moderate party known as Girondists, but in doing so compassed his own death, for the Mountain or extreme party, finding their hands free, pursued a course of bloodshed that disgusted even Danton, and the latter soon found that his influence was being undermined by the austere but unscrupulous Robespierre, who rapidly gained the current of popular favour. After an ineffectual effort made to bring about a reconciliation between the rival leaders, Danton retired into private life with his young wife. Urged to strike the first blow, he remarked, "I prefer being guillotined to guillotining." In 1794 he was arrested, and, along with several friends, lodged in the Luxembourg on a charge of malversation, and after an eloquent defence, cut short by an infamous decree of the Committee of Public Safety that those who had "insulted Justice" should not be heard, was guillotined on the 5th of April.

Danube, THE, next to the Volga the largest river in Europe, has its origin in the union at Donaueschingen of two streams, the Brege and Brigach, which rise on the eastern slope of the Schwarzwald in Baden. Its general course is E.N.E. to Ulm, and thence, watering the plain of Bavaria, past Donauwörth, Ingolstadt, Kelheim, Ratisbon, Straubing, and Vilshofen, E.S.E. to Passau. From Passau it continues its course, after entering Austrian territory, past Linz to Vienna, Presburg, and Komorn, and, on reaching Waitzen in Hungary, takes an abrupt turn S., passing Buda-Pesth and continuing its course through the Hungarian plain. At Vukovar in Slavonia it again takes a S.E. course, and, after forming a boundary

thence between Hungary and Slavonia to Belgrade and later between Hungary and Servia until it reaches the "Iron Gate," E. of Orsova, the river, at this point forcing its way through the mountains, forms a series of cataracts and whirlpools, and taking a more southerly course, sweeps past Widin, and about 10 miles S. of that town, turning almost due E., flows as the boundary between Wallachia and Bulgaria past Lom-Palanka, Rahova, and Nicopoli to Sistova, whence, after passing Rustchuk on its southern bank, it arrives by a N.E. course at Silistria, and enters Wallachian territory. At Tchernovada, turning almost due N., it flows past Matchin, Hirsova, and Ibraila to Galatz, and, thence taking a S.E. direction, falls by four mouths, viz. the Kilna, Stambool, St. George's or Edrillis, and Soolina, into the Black Sea. The sportsman finds a good hunting ground in the desolate country of the Delta, which abounds in large game and countless specimens of the feathered tribe. Numerous tributaries combine to swell the waters of the Danube in its course of 1,740 miles, notably, in Wurtemburg, the Iller; in Bavaria, the Lech, the Paar, the Altmühl, the Regen, the Isar, the Vils, and the Inn; in Austria, the Traun, the Enns, and the March; in Hungary, the Raab, the Waag, the Sio, the Drave, the Theiss, and the Temes; in Servia, the Save and Morava; in Roumania, the Schyl, the Abuta, the Vede, the Arjish, the Jalomitza, the Sereth, and the Pruth; in Bulgaria, the Isker, the Vid, the Jantra and the Lom. The Danube drains 315,000 square miles in its course, and several attempts have been made to improve the navigation at the Iron Gate. In 1888 500,000 florins were voted by the Hungarian Diet for this object. The average fall of the river is 18 inches per mile. Ships enter from the Black Sea by the Sulina mouth, at which there is now a depth of 20 feet of water over the bar. It is connected with the Rhine and the Elbe by canals.

Danville. 1. A city of Illinois, capital of Vermillion county, 124 miles S. of Chicago by rail, contains several public buildings, mills, foundries, and factories. Coal-mining is extensively carried on in the neighbourhood. 2. The capital of Boyle county, Kentucky, 114 miles S. of Cincinnati, contains the Centre College, a Presbyterian foundation, containing about 150 students, dating from the year 1819. 3. The capital of Montour county, Pennsylvania, on the right bank of the N. branch of the Susquehanna, 67 miles N.E. of Harrisburg, is readily accessible by rail, and contains extensive ironworks and numerous public buildings, including a State insane asylum. 4. A city of Pittsylvania county, Virginia, on the river Dan, 65 miles S. of Lynchburg, is the S.W. terminus of the Virginia Midland Railroad. It is the seat of numerous tobacco factories and flour, grist, and cotton mills. Its trade in tobacco is very extensive.

Danzig, a commercial city and seaport, capital of the province of West Prussia, on the Vistula, is strongly fortified, and connected by rail with the principal towns of Germany. Circular in form, with four gates and nine suburbs, its general appearance is sombre and dull. It contains a cathedral and numerous other ecclesiastical buildings, with schools, a public library, observatory, museum, hospitals, arsenal, navy yard, etc. Its principal manufactures are gunpowder, vitriol, firearms, tobacco, silks, woollens, ribbons, wire, jewellery, and gold and silver stuffs. It is the seat also of flour-mills, breweries, distilleries, sugar refineries, and dye-works. Among its exports it reckons various kinds of grain, timber, spirits, beer, zinc, linens, and flax. The city was formerly one of the Hanse Towns, under the control, first of the Teutonic knights and then of Poland, but fell to Prussia at the second partition of Poland in 1793. A canal enables large vessels to come close up to the town, which is 284 miles N.E. of Berlin by rail.

Daphne. 1. A nymph beloved by Apollo and changed by him into the laurel (Greek *daphnē*). 2. The seat of a temple of Apollo, with a grove of cypresses and laurels and a sanctuary, near Antioch in Syria. It was the scene of almost perpetual orgies of vice. 3. The name is applied in botany to the genus of shrubs belonging to the *Thymelaceæ*, or lace-bark tribe. They have a tough bast; hermaphrodite flowers, which are generally fragrant; a calyx of four united and often petaloid sepals; no corolla; eight epiphyllous stamens; and a drupaceous fruit. *D. laureola*, the spurge-laurel, is a dwarf evergreen, common on calcareous soils, with greenish flowers. Several other species are cultivated.

Daphnia, a genus of crustacea belonging to the order Cladocera, and including one of the commonest and best known of the "water fleas"; this is *Daphnia pulex*, which occurs in nearly all ponds and ditches. As it is so common it serves as a good type of this group. The animal has a distinct head prolonged forward into a prominent beak; just beneath this are two pairs of antennæ; those of the posterior pair are large, branched, and jointed, and serves as the swimming organ; the anterior pair is rudimentary. From the form of these in *Daphnia pulex* this species is known as the "branched-horned water flea." The rest of the animal is enclosed in a bivalve shell: the antennæ are protruded through an aperture between the valves at the anterior end. There are five pairs of thoracic limbs; the four posterior pair are respiratory in function; they are in constant motion and give the animal a somewhat quivering appearance. The mouth is armed with three pairs of appendages, one pair forms the labrum, and behind this are the mandibles and jaws. On the head there is a single eye, very large in comparison to the size of the animal; it has about twenty lenses; it is a very familiar microscopic object. The reproduction of the Daphnias contains one point of great interest. The males are very scarce in proportion to the number of the females, but one fecundation of these lasts for life. The females produce two types of eggs; the "summer eggs" are shed into a cavity between the back of the animal and its carapace, and remain there till hatched; successive broods of these are formed, the individuals of which are all females, and these can produce other generations of

females without any sexual intercourse. At the end of summer this method of reproduction comes to an end, the female is fertilised and forms only a pair of eggs which are retained in an "ephippium," a saddle-shaped cavity in the upper part of the carapace; on the death of the parent *Daphnia* the ephippium is cast off and floats about, and the eggs are not hatched till spring. The asexual reproduction by the formation of the summer eggs is one of the typical cases of parthenogenesis (q.v.). Baird recognises seven English species of *Daphnia*, of which *D. pulex* is by far the most common.

Darbhangar, an Indian town of Behar, capital of the district of the same name, on the east bank of the little Bághmati river. It contains an unusual number of large tanks, the Maharajah's palace, bazaars, and a fine market place and hospital. During the rains the country round becomes a swamp. The chief exports are oil-seeds and timber; and the imports lime, iron, salt, grain, and soft goods. The district is productive of tobacco, rice, mustard, indigo, and linseed, and contains manufactories of cloth, tobacco, indigo, sugar, and pottery.

D'Arblay, MADAME, originally Miss Frances Burney, second daughter of Dr. Burney, a novelist, was born at Lynn Regis, Norfolk, in 1752. Commencing to write very early, at the age of fifteen, she destroyed all her first essays, but in 1778 her novel *Evelina* proved a marked success, was favourably criticised, and became the talk of the town. Johnson, Mrs. Thrale, Burke, and Reynolds accorded it unstinted praise, and her name as a gifted authoress was fully established. For her second work, *Cecilia*, revised by Dr. Johnson, she received two thousand pounds from the publisher, and its popularity exceeded, if possible, that of its predecessor. In 1786 she obtained and held for five years the post of one of the Keepers of the Robes to Queen Charlotte, but at the end of that time resigned owing to ill-health, and in 1793 married Count D'Arblay, a French officer. She died at Bath in 1840 in her eighty-eighth year. Her other principal works are *Camilla, a Picture of Youth*, sold for three thousand pounds, *The Wanderer; or, Female Difficulties*, *Memoirs* of her father, and her *Diary*, the last valuable for the light it throws upon court life of that period.

Darboy, GEORGES, Archbishop of Paris, was born in 1813 at Fayl-Billot, Haute-Marne. Educated at the seminary of Langres, he was ordained priest in 1836, and made vicar of Saint Dizier, and in 1845 came to Paris, where he was appointed to various ecclesiastical offices. In 1854 the Pope conferred upon him the title of Protonotary Apostolic, and in 1863 he was created Archbishop of Paris, in which position his moderation often brought him into collision with the Ultramontanes, and lost him the favour of the Vatican. Though opposed to the doctrine of the infallibility of the Pope, he accepted the proclamation when issued in all submission. Seized as a hostage by the Communists in 1871, he was carried first to Mazas, and then to La Roquette, in the courtyard of which prison he was brutally shot on the 27th of May.

Dardanelles, HELLESPONT, or STRAIT OF GALLIPOLI, a narrow strait connecting the Sea of Marmora with the Grecian Archipelago. Its length is about 140 miles, and its breadth from 1 to 4 miles. The narrowest part of the channel, which runs from N.E. to S.W., is in the neighbourhood of Abydos, famous as the point where Xerxes' army crossed in his invasion of Greece, 480 B.C., and as the landing place of Alexander in his Asiatic expedition, 334 B.C. Both shores, which are well supplied with harbours, are strongly fortified. The scenery on the Asiatic shore is exceptionally beautiful, on the European side wild and rugged. By the treaty of Berlin, in 1878, it was finally decided that no foreign man-of-war should enter the straits without the consent of Turkey.

Dardanus, a son of Zeus and Electra. Tradition placed his birthplace severally in Arcadia, Crete, Troas, and Italy. He is the mythical ancestor of the Trojan and Roman nations. Having migrated from Arcadia to Samothrace and established a colony, he continued his wanderings to Phrygia, where he founded the city of Dardanus on land ceded to him by King Teucrus.

Dardistan, a tract of country, few particulars of which are known, bordering on Cashmere in Central Asia. The district is wild and mountainous, and its people, converts from Buddhism to Mohammedanism, are of Indo-European race, and little civilised. The boundaries of the country, including Gilgit, Hasora, and Tassin, are not clearly defined.

Dardu, a historical people of the Upper Indus valley from them called Dardistan, are the Darada of the Hindu records, the Derdai or Deradai of the later Greek writers, and belong to the Galcha branch of the Aryan family, settled in their present mountain homes since the time when the Hindus first penetrated from the North-West into India. The language shows closest affinities to the Kashmiri and Panjâbi Neo-Sanscrit tongues, while the type is distinctly Caucasic, resembling that of the neighbouring Siah-posh Kafirs and Kashmirians. The political organisation is based not on tribal but on caste (*i.e.* social) distinctions, the chief castes being:—1, Ronu; 2, Shîn; 3, Yashkun, the most numerous, agricultural; 4, Kremin, answering to the Indian Sudras; 5, Dûms, answering to the low caste Marâsi of the Panjâb, and to the Doms of other parts of India. The inhabitants of Gilgit, Se, Haramosh, Hasora, Pumâl, Nagar, Hunza, Yâsîn, Chitrâl, Mastûg, Goigâl, Darel, Tangir, Gor, Koli, Pâlus, and Chilâs are all Dardus whose domain comprises the whole region of North Kashmir between Baltistan and Afghânistan east and west. A few in the eastern districts are Buddhists, but all the rest Mohammedans, who have transferred to the cow the Mussulman abhorrence of the dog and pig, otherwise a freedom-loving, independent people, but gentle, intelligent, and upright. (*See* G. W. Leitner's *Results of a Tour in Dardistan*, Lahore, 1870, and *On the Races and Languages of Dardistan*, in *Journal* of the

Ethnol. Soc., April, 1870. Fr. Drew, *The Jummoo and Kashmir Territories*, London, 1875.)

Dar-Fur, a country of Africa annexed by Egypt in 1875, in East Sûdân, bounded by Kordofan on the east and Wadai on the west, and having an area of about 450,000 square miles. A ridge of mountains, called Marrah, crosses the district, the climate of which is intensely hot. It is traversed by numerous streams, in the neighbourhood of which the soil is fertile, but much of the land is desert. The rainy season in the autumn continues for 75 days. Tobacco, rice, millet, maize, wheat, the tamarind, and date abound. Copper and iron are among its products, and an export trade is done in these minerals and ivory, feathers, and gums. The people, who are of Arab-negro race and Mohammedans, are rich in flocks, and at present own the supremacy of the Khalif Abdallah, successor to the Mahdi.

Darfuri. [FÛR.]

Darien, or PANAMA, ISTHMUS OF, is a horseshoe-shaped strip of land uniting North and South America, and separating the Atlantic from the Pacific Ocean. It varies in breadth from 30 to 70 miles, and is bounded on the north by the Gulf of Darien, on the south by the Bay of Panama. The rainfall is heavy, and the climate unhealthy. Minerals, including gold, iron, and copper, abound, and a brisk trade is carried on in these metals and pearls by the natives with European traders. The isthmus contains a good harbour and excellent roadstead, and in parts is well wooded.

Darien Scheme. William Paterson, the founder of the Bank of England, conceived the project of opening a new trade route between Europe and the East by way of the Isthmus of Darien or Panama. He therefore induced the Scottish parliament to pass an Act in 1695 incorporating the Darien Company with very extensive powers. It was authorised to form settlements in Asia, Africa, and America, to make treaties with foreign powers, and to provide for the defence of its settlements. Civil and religious liberty was to be a feature of the government. The directorate was to be half English and half Scottish; in fact, however, the company was intended as a Scottish rival to the English East India Company, which controlled the Cape route to India, Scottish trade having been much interfered with by the Navigation Act of 1660. The Scots took up the project with enthusiasm, and capital was also subscribed in Hamburg and Amsterdam, as well as in England. Great opposition, however, was caused in England by the grant of these privileges to a company which was so largely Scottish, and the English and Dutch subscriptions were almost wholly withdrawn. The scheme, however, continued, about £400,000 (nominal) having been subscribed in Scotland. In 1698 a small squadron sailed (it would seem with a singularly unsuitable cargo), and, taking up land by agreement with the natives on the Isthmus of Darien, proceeded to found the city of New Edinburgh. They had, however, occupied territory claimed by Spain, whose government protested at once. A second expedition sent out from Scotland arrived in 1699, but found that the first had deserted the city and left for New York. A Spanish squadron now anchored off the town, and after lengthy negotiations the colonists abandoned the scheme altogether in April, 1700. Quite half of them perished, chiefly from disease. Paterson escaped, but for a time became insane through his sufferings. His scheme, it may be noted, included a Panama Canal.

Darius I., King of Persia, son of Hystaspes, ascended the throne after the death of the usurper Smerdis, 521 B.C., and in the belief that his life was in danger, caused Intaphernes, one of seven conspirators who had effected the death of Smerdis, to be put to death. After this he reigned supreme, and turned his attention to the consolidation of his empire, uniting himself by marriage with the royal house, and making Susa his capital. After suppressing numerous revolts and dividing the empire into twenty satrapies, he turned his mind to enlarging his dominions, the confines of which he advanced to the Caucasus and Indus, but in 515 B.C. he signally failed in an expedition against the Scythians, losing 80,000 men. Thrace having been conquered by his general, Megabazus, after an interval of peace Darius carried out his probably long-cherished plan of an invasion of Greece, and crossed the Hellespont, but suffered a signal defeat at Marathon 490 B.C. He died 485 B.C., when a rebellion in Egypt was in full force, and during preparations for a third invasion of Greece.

Darjeeling, or DÁRJÍLING, a town and seat of the executive of Darjeeling district on the Himalayas, Bengal, acquired by the Government as a sanatorium in 1835, stands on a lofty eminence with wooded valleys on each side. It is a favourite resort for visitors and invalids, and the health station of the Lieutenant-Governor of Bengal. The scenery of the district, which has a moist, yet healthy climate, cannot be surpassed. Its mineral products include coal, iron, copper, and slate, and its principal industry is the manufacture of tea. Good pasturage exists in the government forests and on the more lofty mountains, and game, large and small, is fairly abundant.

Darling, a tributary of the Murray, in Australia, 1,160 miles in length. It has its source in the N.E. of New South Wales, and, taking a S.W. course, forms the boundary between Queensland and New South Wales. It has numerous tributaries, including the Macquarrie, the Namoi, the Castlereagh, and the Warrego.

Darling, GRACE, daughter of the keeper of the Longstone lighthouse on the Farne Islands, was born at Bamborough in 1815. In 1838 a steamer, named the *Forfarshire*, struck on the rocks of the islands; and after a portion of the crew had escaped by boat and another portion been washed overboard, Grace Darling and her father, while a tremendous sea was running, at the imminent risk of their lives put off from the lighthouse and rescued the survivors. A large subscription was

raised on her behalf. She died of consumption, in 1842.

Darling Downs, a range of hills, elevation 2,000 feet, of Queensland, Australia. The district, which has an area of 6,000 square miles, contains fine pasturage as well as excellent agricultural land.

Darling Range, a chain of mountains of West Australia, running parallel with the coast, varying in height from 1,500 to 2,000 feet, and rich in sandalwood and timber.

Darlington, the cradle of our railway system, is a parliamentary borough with municipal rights in the S.E. of the county of Durham, overlooking the Skerne, 4 miles S. of Stockton. Here are numerous factories for making and repairing locomotives and rolling stock, rail-mills, wool mills, blast furnaces, and iron and steel works. The town contains several fine public buildings, including a free library opened in 1885, the fine collegiate church of St. Cuthbert, the original building dating back to the 12th century, numerous schools, banks, and churches of lesser note, and a commodious railway station newly built. Darlington was enfranchised in 1867, and returns one member.

Darmstadt, a town of Germany, capital of the Grand Duchy of Hesse-Darmstadt, on the river Darm, 15 miles S. of Frankfort, consists of an old and new town, the streets of the former being confined and irregular, while the latter has broad and well-made thoroughfares. Both towns are enclosed by a wall, and contain many buildings of interest as well as promenades and public gardens. The most noteworthy structures are the ducal palaces, old and new, the former containing valuable works of art, the palaces of the princes, the post-office, and the opera-house. There are manufactures of tobacco, paper, carpets, chemicals, cards, hats, and wax candles.

Darnley, Henry Stewart, Lord, husband and cousin of Mary, Queen of Scots, and eldest son of the Earl of Lennox, was born in 1546. His marriage was strongly disapproved both by the Earl of Moray and Queen Elizabeth. His violent temper, dissolute habits, and, above all, his connection with the murderers of Rizzio, soon estranged from him his wife's affections. He met his death by a gunpowder explosion at Kirk of Field, Edinburgh, in 1567, while Mary was attending a masque at Holyrood. [Mary, Queen of Scots.]

Darter, any bird of the genus *Plotus* of the Pelican family, with four species, South America, Africa, India, and Australia each having a characteristic one. These birds are about 3 feet long, with dark plumage marked and dotted with white. The neck is very long and flexible, whence they are sometimes called snake-necks. They nest and perch on trees near running water, whence they swoop down with great dexterity on fish, which forms their chief food.

Dartford, a Kentish market town, 16 miles S.E. of London, on the Darenth near its junction with the Thames, and on the North Kent Railway. The ancient church has an embattled tower, and there are remains of an Augustinian convent founded by Edward III. The first English paper mill was established here, as was also the first iron rolling mill. The town has paper, corn, and oil mills, a large foundry, a gunpowder factory, and calico and silk printing works.

Dartmoor, a large moorland and forest tract of West Devonshire. The forest rights belong to the Duchy of Cornwall. The only timber the moor produces is dwarf oak, ash, and willow. Extending 20 miles from N. to S., with a breadth of 20 miles, and an area of about 150,000 acres, the surface is mountainous and rugged, and abounds in tors, of which Yes Tor has a height of 2,050 feet. In swamps on the moor the rivers Dart, Teign, and Taw, as well as others, take their rise. A prison, which was built for French prisoners in the early part of the present century, has since been turned into a convict prison, and is surrounded by a district which has been brought into cultivation. The settlement of over 30 acres takes its name from the adjoining village of Princetown. In summer cattle and sheep are pastured on the moor, but in winter it is a stormy, forlorn, and desolate region. Tin, copper, and iron have been worked, and gold has been found in the rivers. Attempts, too, have been made to utilise the peat, which is plentiful, but little success has attended them. The chief product is china-clay. It is a bleak bare upland moor of heather and peat-bog rising into numerous summits capped by piles of remarkable detached and disintegrated granite blocks known as "tors." Some of these blocks have been hollowed into "rock-basins" by weathering. The moor is rich in stone monuments, the maenhirs, or large upright stones, lines of stones as at Carnac in Brittany, villages of round stone huts, pounds, or enclosures, with stone walls, and "clam" or slab bridges being pre-historic; whilst numerous granite crosses belong to a more modern date. Dartmoor has been a royal forest from early times.

Dartmouth, a seaport, market town, and municipal borough of Devonshire, near the mouth of the Dart, and 30 miles S. of Exeter. The town is picturesquely situated on a succession of steep rocky slopes, and the streets are mounted by steps. There are the remains of an old castle, and among the churches the fourteenth-century church of St. Saviour is notable, and contains a handsome rood-loft and stone pulpit. The harbour, the entry to which is protected by a battery, is deep and well sheltered. Many yachts use it, and the Castle Line of steamers for South Africa call for the mails. The trade of the town is considerable. Dartmouth has played a considerable part in history. The Crusaders of Richard Cœur de Lion started from it, and it was attacked in 1404 by the French, who were repulsed by the women. It supplied ships for the invasion of France.

Darts, a series of British nocturnal moths (*Noctuæ*) including the "Sand-dart" (*Agrotis ripæ*),

which lives among sand dunes, the "Crescent-dart" (*A. lunigera*), and the "Garden-dart" (*A. nigricans*).

Daru, Pierre Antoine, Comte (1767–1829), a French statesman and writer, was born at Montpellier. He became a soldier at the age of 16, and, having adopted revolutionary principles, he came to the notice of Napoleon, who thought highly of him and appointed him Intendant-General of Austria and Prussia in 1805 and following years. On Napoleon's return from Elba he was made Minister for War. He was appointed a member of the National Institute in 1805, and in 1815 became President of the Academy. Louis XVIII. made him a peer in 1818, but he always combated the reactionary tendencies of the Bourbons. Among his works are a *Life of Sully*, a *History of Venice*, a translation of Horace, and *Poems*.

Darwâzi, the inhabitants of the Afghan province of Darwâz between the Pamir and right bank of the Upper Oxus, are pure Aryans of Galcha stock, with mixed light and dark elements, as seen especially in the women, some of whom have European, others gipsy-like features; speech Persian, differing little from the dialect current in Bokhara; they are Mohammedans of the Sunni sect, and in other respects differ little from the Tajiks of East Turkestan. (*See* Dr. A. Regel, *Proceedings of the Royal Geographical Society*, July, 1882.)

Darwen, Over, a municipal borough of Lancashire, situated in a valley, $3\frac{1}{2}$ miles S. of Blackburn. The town is well built of stone, well drained, and has a good supply of water. Among its public buildings are a market-house, a free library, and public baths. Besides its sixty cotton mills, which contain over 400,000 spindles, there are paper, iron-casting, and earthenware industries.

Darwin, Charles Robert, was born at Shrewsbury, February 12, 1809, being the grandson of Erasmus Darwin, who anticipated in his verse much of the theory of descent promulgated by Lamarck, and of Josiah Wedgwood, the famous potter. He early exhibited a passion for collecting, and the classical training of Shrewsbury grammar school, then under Dr. Butler, was irksome to him. In 1825 he went to Edinburgh University, where he made his first discovery—that of the larval nature of the so-called ova of the sea-mat—and read his first scientific paper. After two years he was removed to Christ's College, Cambridge, where the friendship of Professors Henslow and Sedgwick finally converted him from a devotee of field sports into an enthusiastic student of nature. After taking his degree in 1831, at Henslow's suggestion he volunteered to accompany Fitzroy as naturalist to the *Beagle*, in that voyage which was the main event of his life, and the narrative of which, published in 1839, was to become a classic in the literature of travel. On his return in 1836 Darwin devoted himself to the editing of the material he had collected, with the assistance of several specialists, was elected fellow of the Royal Society, and from 1838 to 1841 acted as secretary of the Geological Society, to which he contributed important papers on South American volcanoes, foliation, etc. In 1839 he married his cousin, Emma Wedgwood, by whom he had several children, who have attained distinction in various branches of science. Darwin then settled at Down, near Beckenham, Kent, where he resided for the remainder of his life, his health having permanently suffered from the voyage. In 1842 he published his work on *Coral Reefs* (q.v.), which gave the first full and satisfactory description of their formation; in 1844, one on *Volcanic Islands;* in 1846, one on the geology of South America; and in 1851 and 1854 four volumes dealing with all known barnacles living and fossil. He thus established a reputation as a thoughtful traveller, a keen observer, a master of geological reasoning, and a cautious student of anatomy. Happening in 1838 to read Malthus's *Essay on Population*, it suggested to him the idea of natural selection, the key-note of his theory of descent, though the problem of the origin of species had engaged his thoughts when on the *Beagle*. The anonymous publication of Robert Chambers's *Vestiges of the Natural History of Creation* in 1844 stimulated his interest in his inquiries, and twelve years later, at the advice of Lyell, he began a large and comprehensive work. The discovery that Mr. Alfred Russel Wallace (q.v.) had arrived at identical conclusions led Darwin to prepare a summary of his views. This appeared as *The Origin of Species by Means of Natural Selection* in 1859, and created a profound sensation. Darwin then devoted himself to elaborating the evidence in certain special directions, especially by experiments in vegetable physiology. The *Fertilisation of Orchids* by insects formed the subject of a volume in 1862, and that of other plants was afterwards dealt with. *The Variation of Animals and Plants under Domestication*, two volumes issued in 1868, in which he put forward the provisional hypothesis of pangenesis (q.v.) in explanation of heredity, were an important instalment of the evidence from one direction. In 1871 he dealt with the extension of his theory to the human species, in which he had been anticipated by Huxley, Lyell, and Häckel, by his *Descent of Man*, in which work also he supplemented the theory of natural selection by suggesting the action of sexual selection. The following year he published the *Expression of the Emotions in Men and Animals;* and then he returned to vegetable physiology, issuing volumes on *Insectivorous Plants* (q.v.), the *Forms of Flowers*, and the *Movements and Habits of Climbing Plants*, in 1875, 1877, and 1880 respectively. Darwin died at Down, April 19, 1882, and, in accordance with the feeling of the nation, was laid beside Newton in Westminster Abbey on the 26th. His *Life and Letters* were published in 1887, his portrait by the Hon. John Collier adorns the walls of the Linnean Society, and his statue by Boehm seems to preside over the Natural History Museum at South Kensington; but the impress of his work is stamped more indelibly than that of any other naturalist since the days of Aristotle, not only upon biology, but upon many sciences apparently least likely to be affected by it.

Darwinism, a name often erroneously applied to the theory of descent, a theory which Darwin in no wise originated, though he transformed it from

the unverified hypothesis which it was in the hands of Lamarck (q.v.), Geoffroy St. Hilaire and Robert Chambers, into a well-authenticated and reasonable explanation. This transformation was accomplished by the theory of natural selection, and, though Darwin himself admitted that he had looked somewhat too exclusively upon natural selection as the agent of specific change, it is the theory of natural selection that is rightly termed Darwinism. "Species," he says, "have been modified, during a long course of descent. This has been effected chiefly through the natural selection of numerous successive, slight, favourable variations: aided in an important manner by the inherited effects of the use and disuse of parts, and in an unimportant manner by the direct action of external conditions, and by variations which seem to us in our ignorance to arise spontaneously." The biological laws upon which he bases his arguments are, in his own words, "Growth with reproduction; inheritance which is almost implied by reproduction; variability from the indirect and direct action of the conditions of life, and from use and disuse; a ratio of increase so high as to lead to a struggle for life, and as a consequence to natural selection, entailing divergence of character and the extinction of less improved forms." These laws have been otherwise expressed as amounting to—(1) the admitted facts of inherited likeness accompanied by individual variation; (2) the tendency, pointed out by Malthus, of all organisms to increase far beyond the space or subsistence available for them, while land, sea, and oxygen are limited in amount; (3) the necessarily resultant struggle for existence keenest among the closest allies; and (4) the inevitable natural selection, or survival of the fittest.

Darwin, it will be observed, makes little endeavour to explain the origin of variations. His subject is the origin of species or of specific divergence, the selection of certain variations and their isolation by the elimination of intermediate forms. He postulates spontaneous variation in various directions and a vast expanse of time in which slight variations may accumulate and compete in the battle for life. Mr. Wallace, who arrived at the theory of natural selection simultaneously with Darwin, has shown that many initial variations are by no means slight, so that natural selection may have acted rather more rapidly; and that, whatever action external conditions, the use and disuse of organs, or sexual selection may have, they will all be subordinated to, or regulated by, natural selection. Darwin substantiated his views by evidence drawn from embryology, and from the existence of rudimentary (now called "vestigial") organs; and answered in detail objections drawn from the alleged perfection of the organs of the senses, the alleged inerrancy of instinct, the alleged sterility of hybrids, and the absence, as far as our knowledge went in 1859, of the "missing links," which, but for the imperfection of the geological record, we might expect to find as fossils.

Some of the effects of his theory upon biology have been to direct more minute attention to slight variations in both wild and domesticated forms; to make us look for the uses to its possessor of every detail of structure, and so to study habits more intelligently; to exhibit fossils to us as a connected series, and to get rid of all the old anxieties as to whether a form was or was not a "good species," *i.e.* a distinct creation. The sciences of embryology, comparative psychology, anthropology, and sociology, have received from Darwin's theory or from his rehabilitation of the general theory of descent an impulse all but tantamount to creation.

Recently some naturalists have revived Lamarck's view as to the importance of the use or disuse as modifying the form or structure of organs, whilst others altogether deny the inheritance of newly acquired characters. [DEVELOPMENT, EVOLUTION.]

Dasent, SIR GEORGE WEBBE, was born in 1817 at St. Vincent, in the West Indies, where his father was attorney-general. He was educated at Westminster and at King's College, London, going from there to Magdalen College, Oxford, where he graduated B.A. in 1840. In 1852 he was called to the bar, and proceeded to the degree of D.C.L. at Oxford. For some time he was assistant editor of the *Times*, and married the sister of the chief editor, Mr. Delane. He often examined Civil Service candidates, and was appointed a Civil Service Commissioner, being knighted in 1876. Among his achievements in the departments of philology and folk-lore were his *Popular Tales from the Norse*, a work which with its interesting preface is deservedly popular, *The Saga of Burnt Njal*, and *The Story of Gisli*. He also wrote some novels, the best known of which is perhaps *Annals of an Eventful Life*. He also did much in the cause of Icelandic literature.

Dash, COUNTESS, the nom de guerre of a French writer, Gabrielle, Comtesse de Saint-Mars (1804–1872), born at Poitiers. She married early, and, falling upon evil times, took to literature as the means of earning her livelihood. Her novels deal chiefly with the incidents of aristocratic life, and are somewhat stilted and unreal. The best known among them are perhaps *La Pomme d'Ève*, and *Aventures d'une Jeune Mariée*.

Dashkoff, CATHERINE ROMANOWNA, PRINCESS (1744–1810), of the noble Russian family of Woronzoff, was the early friend and *confidante* of Catherine II. of Russia. Left a widow at 18, she aided Catherine in putting her husband off the throne, levying for this purpose a body of cavalry. She was, however, in favour of a constitutional government rather than a despotism, and as her views were displeasing to the Czarina, she left the court and devoted herself to studies, making especially Greek and Latin her subjects. She also travelled in France, Germany, Italy, and England. In 1782 she became directress of the Russian Academy of Sciences and President of the Russian Academy. In 1796 Catherine died, and her successor, Paul III., dismissed the Princess to her estates in Novgorod. She here gave her time to literature, writing much, among her productions

being some comedies; and she had a great share in producing the *Russian Academy Dictionary*.

Dasyure, any animal of the marsupial genus Dasyurus, with four species, from Tasmania and Australia, approaching the Carnivora in structure and habit. The canine teeth are well developed, and the premolars and molars have sharp cusps. The best known species is *D. ursinus*, the "Tasmanian devil" of the colonists. It has been compared to a small bear, with long legs and tail, but the body is only about 2 feet in length. The fur is black and coarse, with a broad white band across the chest and another over the back close to the tail. These animals are very savage, and prey on poultry, and in some cases attack sheep. Other forms are the Spotted Dasyure (*D. maculatus*), about the size of a cat; Mauge's Dasyure (*D. maugei*), still smaller; and Geoffroy's Dasyure (*D. geoffroyi*), which preys on mice, rats, and birds. None of the genus has a true pouch.

Date, the drupe-like fruit of the date-palm, *Phœnix dactylifera*, a tree 60 to 80 feet high, with large pinnate leaves, cultivated in immense quantities in North Africa, Western Asia, and Southern Europe. The stem is covered with leaf scars; the flowers are dicœcious, each having a gamosepalous calyx of three sepals and three petals; there are usually six subsessile anthers and three distinct ovaries, but only one of the latter develops into the one-seeded fruit. The stony seed is mainly dense metasperm, having the walls of its cells much thickened with cellulose which is absorbed in germination. The wood of the stem is used in building; huts are built of its leaves; the petioles are made into baskets and the fibre surrounding their bases into ropes and coarse cloth; the young leaf-bud or "cabbage" is sometimes eaten as a vegetable, or, if tapped, it yields a sugary sap which may be fermented; and even the seeds are ground into meal for camels. A few years ago a company was floated for the manufacture of coffee from date-stones. In Central Arabia and some parts of North Africa the fruit forms the staple food of the inhabitants, camels, horses, and dogs also eating it. It has been shown to be the "lotos" of the lotos-eaters of ancient times, and its leaves were probably those strewn before Christ on the entry into Jerusalem.

Datia, a native Indian state of the Bundelcund district, with a population of 182,600, with a capital of the same name, 125 miles S.E. of Agra. The city was formerly of considerable importance, and contains some ancient palaces.

Dative, in grammar, the case of the "indirect object" of any action for or with reference to whom the action is done—*e.g.* the recipient of a gift. The term (Lat. *dare*, to give) is a Latin translation of the Greek adjective *dōtikē* (connected with giving). [DECLENSION.]

Datum Level, the base or horizontal line from which in surveying all heights or depths are measured. The Trinity high-water mark, fixed in the year 1800, is the usual datum-level in the neighbourhood of London. High-water spring tides are very generally employed.

Daubenton, LOUIS JEAN MARIE (1716–1799), a French naturalist and physician, born at Montbard. He aided Buffon in the early part of his work on *Natural History*, taking the anatomical department. But a dispute between them put an end to the collaboration. In 1745 Daubenton became keeper of the Cabinet of Natural History at Paris, and occupied himself with mineralogy, botany, agriculture, and kindred subjects. In 1778 he was appointed Professor of Natural History in the College of Medicine, and in 1785 Professor of Mineralogy in the Museum of Natural History. He was made a senator in 1799, but died at the first sitting that he attended.

Daubeny, CHARLES GILES BRIDLE (1795–1867), an Oxford professor, born at Stratton in Gloucestershire, and educated at Winchester and Magdalen College, Oxford, where he graduated B.A. in 1814, afterwards proceeding to the degree of M.D., and practising as a physician in Oxford. He made researches in Auvergne and in the United States of America, and became successively Professor of Chemistry, Professor of Botany, and Professor of Rural Economy at Oxford. In 1856 he was President of the British Association. Among his numerous writings were works on *Volcanoes*, *Mineral and Hot Springs*, *Agriculture*, *Sexuality of Plants*, and *Climate*.

D'Aubigné, JEAN HENRI MERLE (1794–1872), a Swiss ecclesiastical historian, born at Eaux-Vives, near Geneva. After studying at Berlin, he became pastor of the French Protestant Church at Hamburg. In 1823 he was appointed Court preacher at Brussels, but when Belgium threw off the Dutch supremacy in 1830 he retired to Geneva, where he became Professor of Church History in the theological seminary. He visited England and Scotland, receiving the degree of D.C.L. from Oxford, and the freedom of the city from Edinburgh. Of his writings his *Histoire de la Reformation au XVIème Siècle* is the best known.

Daubigny, CHARLES FRANÇOIS (1817–1878), a French landscape painter and etcher, born at Paris. He studied under his father, who was a painter, and others, and first began to exhibit in the Salon of 1838. His great characteristic was his faithfulness to nature, and many of his studies were made from a house-boat on the Seine. He was of great merit as an etcher, and was an extensive illustrator of books. Among his principal works are the *Pool of Gylien*, *Springtime*, *Windmills at Dordrecht*, and *The Rising Moon*.

Daubusson, PIERRE (1423–1503), a famous French Grand-Master of the Order of St. John of Jerusalem. He entered the service of the Emperor Sigismund, and served under the Austrian Archduke Albrecht against the Turks. Returning to France, he served with distinction against the Swiss in 1444. He then joined the Knights of Rhodes, and became Grand-Master in 1476. He was a formidable enemy of Mahomet II., and his efforts to unite Christendom against the Turkish

inroads gained for him the title of "Shield of the Church." In 1480 a force of 100,000 Turks invested Rhodes unsuccessfully for a month. The failure of this expedition aroused the wrath of Mahomet, who was meditating a greater attack when death came upon him in 1481.

Daudet, ALPHONSE, a noted French writer, born at Nimes in 1840. He was educated in the Lycée at Lyons, and for a time was an under master. At the age of 17 he came to Paris with his brother Ernest, and the privations he underwent have been described in his autobiographical sketches. He gained employment under the Duke of Morny, who supplied him with the original of the "Duc de Moxa" in *Le Nabab*. His exquisite *Lettres de Mon Moulin*, with their vigorous delineation of Southern French life, are well known in England, as is his *Fromont Jeune et Risler Aîné*. But his popularity among us chiefly rests upon his amusing *Tartarin de Tarascon* and *Tartarin sur les Alpes*. A further set of Tartarin's adventures does not arouse the same interest. The Tarasconese were said to be furious against him. His *Sapho* is a powerful book, hardly, perhaps, suitable to general English taste. In 1887 he published *Trente Ans de Paris*, in 1888 *L'Immortel*, a satire upon the Academy, in 1889 *Souvenirs d'un Homme de Lettres*, and in 1892 *Rose et Ninette*. Others of his works are *Les Rois en Exil*, *Jack*, and *Numa Roumestan*.

Daumer, GEORG FRIEDRICH (1800–1875), a German writer, born at Nuremberg. For a time he was professor at the Gymnasium. He then became violently anti-Christian in his views, advancing some extravagant views in his antagonism. Finally he became an ardent Ultramontane. Among his works are some poems.

Daumier, HENRI (1808–1879), a French caricaturist, born at Marseilles. He drew his subjects indiscriminately from political and social life. His earlier efforts were taken from Robert Macaire, and appeared in *Charivari*. After the Revolution of 1848 he produced his *Idylles Parlementaires* and *Représentants Représentés*. In later life he became blind and dependent upon the good offices of a brother artist.

Daun, LEOPOLD JOSEPH, GRAF VON (1705–1766), an Austrian general, whose father and grandfather were both soldiers. After serving in the Turkish war in 1718, he became major-general in Italy in 1734, where he served with distinction. In 1748 he served against the French in the Netherlands, and was made a Knight of the Golden Fleece. After making a brilliant passage of the Rhine and marrying a favourite of Maria Theresa, he was made master-general of Ordnance, and in 1757 field-marshal. He was also the first head of the Order of Maria Theresa, and commanded the Austrian army in the Seven Years' war, when he proved an awkward enemy of Frederick the Great whom he twice defeated. His policy was one of delay, which, however, did not prevail against Frederick, when once he understood it and laid his plans accordingly.

Daungchi, a Bhîl tribe [BHÎL], Daung district, below the Western Ghâts; the most unreclaimable of all these wild tribes, incapable of comprehending anything beyond the most simple communications; they are a stunted, sickly people, whom all attempts to civilise have failed. (*See* Captain Graham, *The Bhîl Tribes of Khandeish*, Part II.)

Dauphin, a title originally borne by the eldest sons of the princes of Vienne and of other great feudal lords. When Dauphiné and Vienne were ceded to the French crown in 1343, Humbert II., their king, made it a condition of the cession that the title should be borne by the eldest son of the French king, and it was so borne down to the Revolution. The name, according to Littré, is a proper name—the same as delphinus, Fr. *dauphin*, a dolphin. The seigneurs of Dauphiné bore three dolphins as arms. Other and more fanciful explanations have been given—one that the word is merely a corruption of "de Vienne," assimilated by popular etymology to the spelling of the name of the fish; another that it arose from the fact that a dolphin was the crest of one of the Counts of Vienne.

Dauphiné, an ancient French province in the old kingdom of Burgundy, divided into Upper and Lower, and making up what are now the departments of Isère, Hautes Alpes, and part of Drôme, lying between Savoy and Provence on N. and S., and Piedmont and the Rhone on E. and W. The capital was Grenoble. From 1032 to 1043 the province was German.

Dauri (DAUCHERI. TAGÛRA), a Manchu people formerly occupying the region from them still known by the name of Dauria; driven thence by the Tunguses, farther east to the valley of the river Nun, where they are now settled, and largely assimilated, in dress, customs, and religion, to the Chinese. They are a fine race, tall, symmetrical, and robust, occupied exclusively with agriculture. Though nominally Buddhists, some still practise Shamanistic rites.

Dauw. [ZEBRA.]

Davenant, SIR WILLIAM (1605–1668), an English poet and playwright, generally thought the son of an Oxford innkeeper, but by some said to be an illegitimate son of Shakspeare. After passing some time at Lincoln College, he became a page in the households, successively, of the Duchess of Richmond and of Lord Brooke. He organised masques, and in 1637, at the death of Ben Jonson, he was appointed Poet Laureate. His Royalist sympathies caused his arrest in 1641, but he escaped to France, and shortly returned with supplies for the king. In 1643 the king knighted him for his services at the siege of Gloucester. Soon after he retired to France, became Catholic, and was attached to the service of the Princess Henrietta. He at this time began an epic poem, *Gondibert*. While trying to lead a French colony to Virginia, he was captured, and was for some time a prisoner at Cowes, where he went on with *Gondibert*. In 1650 he was tried, and is said to have been saved by the efforts of Milton, whose services he requited in like manner

after the Restoration. After two years' imprisonment he started a theatre, and after the Restoration he managed and wrote for a theatre in Lincoln's Inn Fields. Besides his unfinished *Gondibert*, he wrote dramas and masques, and also helped Dryden to spoil Shakspeare's *Tempest*. He was buried in Westminster Abbey.

Davenport, founded in1836, the capital of Scott county, Iowa, U.S. America, near Rock Island and the rapids of the upper course of the Mississippi. The town is built of brick, and has many churches, colleges, and other public buildings. There are steam-mills, and the splendid water-power is greatly utilised. The town has a large grain trade.

David, the second King of Israel, succeeded Saul, and is considered to have lived about the 11th century B.C. Born at Bethlehem of the family of Jesse and the tribe of Judah, he was anointed by Samuel, and after a life of adventure he became first King of Judah at Hebron, and seven years after King of Israel, choosing for his capital Jerusalem, which he took from the Jebusites. He was the great Hebrew hero, endeared to the race by his virtues and, perhaps, not less by his very human failings. His history is detailed in the books of Samuel and in the Chronicles, and is furthermore so familiar to all that it is needless to do more than allude to his appearance in the household of Saul and his friendship with the king's son, Jonathan, to the danger he ran at the hands of the capricious and mad king, to his exile and training of a bandit troop, and to his lamentation over the deaths of Saul and Jonathan. For thirty-three years he reigned, making many conquests among the neighbouring people, and suffering much through his sons like Henry II. of England. He was succeeded by his favourite son, Solomon, son also of Bathsheba, whose seduction, followed by the murder of her ill-fated husband Uriah, forms the greatest blot upon King David's character. The majority of the Psalms are attributed to David by tradition, but recent critical research tends to increase the number of those assigned to a later date. [PSALMS.]

David, FELICIEN (1810–1876), a French composer, born at Cadenet in the department of Vaucluse. He was a chorister at Aix cathedral, and afterwards went to the Paris Conservatoire. He adopted the principles of St. Simonism, and with others went to Constantinople, Smyrna, and Cairo, and suffered much tribulation. On his return to Paris he published in 1835 his *Mélodies Orientales*, and in 1844 his *Désert*, which had a great success. Later works did not meet with the same success. In 1862 he was enrolled in the Legion of Honour, and in 1869 he was appointed librarian of the Paris Conservatoire.

David, FERDINAND (1810–1873), a famous teacher of the violin. He was born at Hamburg, and became a pupil of Spohr. In 1836 he was appointed concert-master at Leipzig, and here he had some of the best players as pupils. He was the author of some good compositions.

David, GERHARD (1450–1523), a Dutch painter, born at Oudewater. In 1484 he became a member of the Painters' Guild at Bruges, and in 1501 was Dean of the Guild. His subjects were chiefly religious, and specimens of his work are to be seen at Rome, Berlin, Bruges, and the National Gallery, London.

David, JACQUES LOUIS (1748–1825), a painter of the modern French school, of which he may almost be called the founder, since he introduced the close study of nature to take the place of the conventionalism till then existing. He was born at Paris, where he studied, and having gained the Grand Prix, went to Rome from 1775 to 1780. His great forte was historical painting, and in 1784 he finished at Rome his noted *Oath of the Horatii*, a work which had been commissioned by Louis XVI. In the same year he produced his *Belisarius*, in 1787 *The Death of Socrates*, and in 1788 *Paris and Helen*. He also made some reputation as a portrait painter. Having entered fully into the principles of the Revolution, he painted in 1789 *Brutus condemning his Sons*. He became a deputy to the National Convention in 1792, and was a staunch adherent of Robespierre. He voted for the death of his old patron, Louis XVI., and in 1794 he presided over the Convention. In 1799 he painted the *Rape of the Sabine Women*. Appointed first painter by Napoleon in 1804, he painted the *Coronation* and *Napoleon crossing the Alps*, and in 1814 he painted his *Leonidas*. After the return from Elba he was made a Commander of the Legion of Honour. At the fall of Napoleon David was banished, and went to Brussels, where he painted *Cupid leaving the Arms of Psyche;* and his last work, in 1824, was *Venus, Cupid, and the Graces disarming Mars*. Many of his pictures are in the Louvre. He excelled as a colourist, and his drawing was correct. Moreau engraved many of his works.

David, ST. (about 601), the patron saint of Wales, was first Archbishop of Caerleon, and then of Menevia (now St. David's). Not much is known of him, though legends speak of his piety, of his energetic opposition to Pelagianism, and of miracles wrought at his tomb. He is said to have written some theological treatises.

David I. (1084–1153), (sometimes called Saint, though never canonised), King of Scotland, son of Malcolm and St. Margaret. In his youth he went to England with his sister Matilda. In 1107, when his elder brother became king, David was made Prince of Cumbria, and in 1110 he married Matilda, heiress of Waltheof, and thereby became Earl of Huntingdon and Earl of Northampton. In 1124 he came to the Scottish throne, and for some years was occupied by battles against tribes of his wild subjects. He took part with Matilda against Stephen, and advanced into England as far as Durham, where he made peace with Stephen. In 1138 he again engaged in war with England, but, deserted by his Norman nobles, he was defeated at the battle of the Standard at Northallerton. He did much towards uniting and organising his kingdom, and was especially active in endowing

bishoprics and founding abbeys, by which he reduced his revenues so greatly that one of his successors declared him to have been a "sair saint for the crown."

David II. (1324–1371), King of Scotland, son of Robert Bruce. He was born at Dunfermline, and married Joanna, daughter of Edward II. He succeeded to the crown in 1329. From 1334 to 1341 he was in France, owing to the predominance of Baliol and of Edward III. In 1346 he declared war upon England in accordance with a promise which he had made in France, and was taken prisoner in the battle of Neville's Cross, and remained a prisoner till 1357, when he was released upon promising to pay a ransom. Unable to pay this, he was for the rest of his life more or less bound to England, and is even said to have proposed a son of Edward III. as his successor, a measure which did not endear him to his subjects.

Davies, Sir John (1570–1626), an English poet and statesman, was born in Wiltshire. He was educated at Queen's College, Oxford, and in 1595 was called to the bar, but was shortly afterwards disbarred for striking a fellow barrister who insulted him. He returned to Oxford in 1599, and there produced a work on the immortality of the soul, under the title of *Nosce Teipsum*. In the same year he published a set of Elizabethan acrostics, called *Hymns to Astræa*. In 1601 he was readmitted to the Middle Temple, and was elected M.P. for Corfe Castle. In 1603 he became James I.'s Solicitor-General for Ireland, and in 1606 he was knighted, made serjeant-at-law, and Attorney-General. He sent home some valuable reports upon the state of Ireland, and had a great share in the planting of Ulster. Returning to England, he was again elected to Parliament, and was nominated Chief Justice, but death prevented his exercising the functions of the office.

Davila, Enrico Caterino (1576-1631), an Italian historian and statesman, was born at Cyprus. At the Turkish conquest of the island in 1561 his father fled to Venice. The son became a page at the French Court, and entered the French service, which he changed for that of Venice in 1599. He was appointed Governor of Dalmatia, Friuli, and Candia, and was considered second only to the Doge in importance. He was shot in 1631 in a dispute concerning the supply of post-horses for his travelling.

Davis, Jefferson (1808–1889), President of the Confederate States, which seceded in 1861 from the American Union. Born in Kentucky, he was educated at Transylvania College, and at West Point, where he graduated as lieutenant of dragoons in 1828. He was employed upon the frontier against the Indians. In 1835 he retired from the army and turned cotton-planter, and married the daughter of General (afterwards President) Taylor. In 1845 he was returned to Congress for Mississippi; and volunteering for the Mexican war, distinguished himself in the field of battle, and in 1847 he became a senator. He was a great advocate of State rights as against Federal prerogative. From 1853 to 1857 he was Secretary for War, after which he again became senator. As President of the seceding States (1861-65) he showed great organising power. He was the last to admit defeat, but, when Richmond fell in 1865 and all hopes were ended, he fled. Being accused of complicity in the murder of President Lincoln, he was arrested and imprisoned in Fort Monroe. After three years of captivity he was released, and retired into private life. He published in 1881 a *History of the Rise and Fall of the Confederate Government*.

Davis, John, one of the greatest of English navigators, was born at Sandridge, near Dartmouth, about the year 1550, and was in youth the friend of Humphrey Gilbert and Walter Raleigh. He very early went to sea, and was by 1579 a captain of considerable reputation. In 1585, with the *Sunshine*, 50 tons, and *Moonshine*, 35 tons, he sailed from Dartmouth, hoping to discover a north-west passage to India and China. In this voyage he explored much of the south coast of Greenland, and then, crossing what is now Davis Strait, discovered Mount Raleigh and Totnes Road in what is now Baffin Land. In 1586 he made a second voyage with the *Mermaid*, 120 tons, *Sunshine*, *Moonshine*, and *North Star*, 10 tons, and got as far north as Rommel's Fiord, on the east coast of Baffin's Bay, part of the flotilla returning by Cumberland Gulf and the Labrador Coast. A third voyage, begun in May, 1587, was continued as far north as Sanderson's Hope. In 1588 Davis, as captain of the hired vessel *Black Dog*, 20 tons, served against the Armada, and it was in memory of this that he afterwards dedicated his manual of navigation, entitled *The Seaman's Secrets*, to Lord Howard of Effingham. In 1589 he joined Cumberland's expedition to the Azores. In 1591, with Cavendish, he embarked on the unfortunate voyage to the Strait of Magellan, a full account of which, by John Janes, is in the Hakluyt collection. In this expedition he discovered the Falkland Islands. His subsequent voyages, three in number, were to the East Indies. In the last of them he was killed, off the coast of Pahang, by some Japanese pirates, on Dec. 27, 1605. *The Seaman's Secrets* was first published in 1594. At about the same time this great seaman invented the "back staff" or "Davis' quadrant," an instrument which superseded the "cross staff" for observing latitude, and remained in general use until 1731.

Davis, Thomas (1814–1845), an Irish poet and patriot, born at Mallow, his father being an army surgeon. He was educated at Trinity College, Dublin, and afterwards visited London and the Continent. In 1838 he was called to the bar. He was an advocate of Repeal, and became co-editor with John Dillon of the *Dublin Morning Register*. In 1842 he became connected with the *Nation*. Besides poems and essays, he published the speeches of Curran, and produced other works.

Davis Strait, between Baffin's Bay and the Atlantic Ocean, separates Greenland from Cumberland Island and British North America. It is in lat. 60° 70′ N., and is 220 miles broad at the Arctic

Circle—its narrowest part. The east coast is rocky and studded with islands; the west coast has some deep indentations, the chief being Hudson's Strait, the entry to Baffin's Bay, and Northumberland Inlet.

Davitt, MICHAEL (b. 1846), a well-known Irish patriot, born in the county Mayo, the son of a Mayo peasant. He was evicted with his family in 1851, and they emigrated to Lancashire, where Michael had the misfortune to lose his right arm by an accident in the cotton factory where he worked. In 1866 he became a Fenian, and in 1870 was sentenced to fifteen years' penal servitude. Released upon a ticket of leave in 1877, he founded the Land League in 1879. In 1881–82 he was sent to Portland on the ground of having broken the conditions of his ticket of leave. In 1885 he published *Leaves from a Prison Diary*, and in 1887 he married. For a time he conducted a workman's paper, the *Labour World*.

Davos, a valley of East Grisons, 16 miles S.E. of Chur, has become a fashionable health resort. The village of Davos-Platz is 5,105 feet above sea level, and its still dry air and sunshine make it very favourable for diseases of the chest. It now abounds in doctors, hotels, and tourists, and consumptive patients frequently winter there. The 3,500 native inhabitants are chiefly German Protestants.

Davoust (or DAVOUT), LOUIS NICOLAS, Duke of Auerstädt, Prince of Eckmühl, marshal and peer of France (1770–1823), was born at Annoux. In 1785 he entered the Ecole Militaire, and was appointed sous-lieutenant of cavalry in 1788. In 1792 he distinguished himself at Jemappes, and in 1793 at Neerwinden. In the same year he became adjutant-general, but was deprived of office as an ex-noble. He was restored after the 9th Thermidor, and served at the siege of Luxembourg; and in 1795 he was with the Army of the Rhine under Pichegru. He was taken prisoner but soon exchanged, and in 1797 distinguished himself at the passage of the Rhine. He took part in the Italian campaign, and was much attached to Napoleon. He was in Egypt, where he was again captured and exchanged. After having the chief command of cavalry in Italy, Napoleon in 1804 made him marshal, grand cross of the Legion of Honour, and colonel-general of his Guard. In 1805 he fought bravely at Austerlitz, and his conduct at Auerstädt in 1806 won him a dukedom. He played an important part in the battle of Eckmühl and at that of Wagram in 1809. In 1812 he was defeated in the retreat from Moscow. In 1813 he was besieged in Hamburg. In 1815 he was Minister for War, and in this capacity signed a convention with Blucher and Wellington, undertaking to withdraw the army beyond the Loire. Seeing that the cause of the Empire was irretrievably lost, he gave in his adherence to Louis XVIII., and used his influence to cause the army to follow his example. The king in recognition of this gave him Court employment. He was a brave and brilliant soldier and a stern disciplinarian, who, perhaps, sometimes carried his love of discipline into the region of cruelty.

Davy, SIR HUMPHRY (1778–1829), a great English chemist, born at Penzance in Cornwall. After a severe life at school, he was apprenticed to a surgeon-apothecary. He had already, while at school, developed a taste for chemistry, and had made some experiments on the air in sea-weed. This attracted the notice of, among others, a Dr. Beddoes, of Bristol, who gave him the post of laboratory assistant. His discovery and publication of the properties of nitrous oxide led to his appointment at the age of 22 as Professor of Chemistry to the Royal Institution. In 1830 he became a member of the Royal Society. Here, besides giving a course of valuable and interesting lectures, he made discoveries in galvanism, and made known the properties of chlorine. In 1810 he received the prize of the French Institution, of which he was appointed corresponding member, and in 1812 he was knighted. In 1813 he published *Elements of Agricultural Chemistry*, and was appointed Professor of Chemistry to the Board of Agriculture, and lectured on the subject. His discovery of the safety lamp, of which he made a present to mankind, marked an era in mining. In 1818 he visited Italy and tried unsuccessfully to unroll the Herculaneum MSS. In 1820 he was President of the Royal Society. In 1824 he made an expedition to Norway, during which he hit upon a method—which, however, did not find a practical success—for preserving the copper of ships' bottoms. He died at Geneva, and the authorities gave him a public funeral. A statue of him was erected at Penzance.

Davy Lamp, a device named after Sir Humphry Davy, the inventor, that partially eliminates the danger of introducing a burning candle or oil-lamp into an atmosphere charged with combustible gas. Such an arrangement is desirable in coal mines, where fire-damp is liable to accumulate, and to explode on the introduction of an open burner. Davy's device is to surround the burner with wire gauze, the meshes being sufficiently close to prevent the passage of the flaming gas inside to the combustible gas outside; the gauze is a sufficiently good conductor of heat to prevent much local increase of its intensity, and of course permits the supply of oxygen necessary for combustion of the flame. Recently the electric incandescent lamp has been introduced in place of the old Davy lamp. In this case complete isolation of the white-hot filament is essential for its existence, so it may be entirely screened from the surrounding inflammable gas.

Dawalla (*Hypophthalmus dawalla*), a Siluroid food-fish from Guiana. The genus includes three other species, all from tropical America. There are six barbels, and the eye is behind and below the angle of the mouth.

Dawari, an Afghân tribe, who give their name to the Dawari Valley between lat. 32° 57′ and 33° 7′ N. There are two main divisions: Tapizae, including the Haidar, Khel, and Idak; and Mâlai, including the Darpa, Amzani, Sô-o, and Mâlakli, with total population about 20,000.

Dawasir, one of the great Bedouin tribes of Central Arabia, who are chiefly located in the valley of like name between Nejd and Asîr. They have never been visited by any European traveller, but are reported to be a lawless, predatory people, ostrich hunters, and of fine physique, very tall, and of dark almost black complexion. Some have migrated to Irâk-Arabi at the head of the Persian Gulf, where the district of Dawasir, on the left bank of the Shatt-el-Arab, is named from them.

Dawkins, William Boyd, born 1838 at Battington, Montgomeryshire, was educated at Rossall and at Jesus College, Oxford. In 1862 he was appointed upon the Geological Survey, and in 1869 became Curator of the Manchester Museum and Professor of Geology in 1874. In 1882 he was made Honorary Fellow of Jesus College and a Fellow of the Royal Society, to which he has furnished many interesting and valuable papers. He has written much on Caves and on Early Man.

Dawson, Sir John William, a geologist and naturalist, born in 1820 at Pictou, Nova Scotia. He studied at Edinburgh, and then devoted himself to the natural history and geology of Nova Scotia and New Brunswick. In 1842 and 1852 he aided Sir Charles Lyell in his researches in Nova Scotia. He became Vice-Chancellor of the McGill University, Montreal, and in 1882 received the medal of the London Geological Society. He was knighted in 1884. Besides discovering the *Eozoon Canadense*, said to be the lowest form of organic life, he wrote *The Story of the Earth and Man*, *Fossil Man*, *The Origin of the World*, and many other subjects.

Dawsoniæ are the small egg, or bell-shaped, or conical bodies found associated with the Graptolites (q.v.). They are supposed to be the "gonangia," or egg capsules, but until one is found in actual connection with a graptolite this view cannot be regarded as free from doubt.

Dax (formerly called Acqx), a French town and watering-place in the department of Landes, on the left bank of the Adour. It was a Roman station, and the old town is surrounded by ramparts, which are in part Roman. The modern suburb Sablon is on the other side of the river, and is joined to the old town by a bridge. There is a castle, a church which was once a cathedral, and a bishop's palace now used for municipal purposes. The town produces stoneware and liqueurs, and it has thermal springs useful in rheumatic disorders.

Day, in *Astronomy*, has two meanings. 1. The *sidereal* day, or the length of time taken for the earth to make exactly one rotation about its axis. This body performing a rotation of 360° in one sidereal day, it follows that such a period is the interval between consecutive passages of any distant star across the meridian. Sidereal time is much employed by astronomers. One result of the tides is to gradually lengthen the day; shrinkage of the earth due to cooling produces the opposite effect, and on these and other accounts the length of the sidereal day has remained wonderfully constant for ages. This interval is divided into 24 sidereal hours, and each such hour into minutes and seconds. 2. The *solar* day is the length of time between successive passages of our sun across any meridian. Inasmuch as we are travelling in an ellipse round the sun, our speed being greatest in winter when we are nearest the sun, the length of the solar day varies throughout the year. It is longest in winter and shortest in summer, but is always greater than the sidereal day on account of the earth's rotation round the sun being in the same sense as its rotation about its own axis. In ordinary usages solar time is desirable, for the use of sidereal time would involve such difficulties as that of 12 o'clock sidereal midday happening at 12 o'clock solar midnight. Thus we are compelled to use solar time; and since the solar day varies throughout the year, a *mean solar day* or average for the whole circuit is taken and subdivided into hours, minutes, and seconds. Such a day is about four minutes longer than the sidereal day. The duration of light and darkness in a day depends on the latitude and on the season. If we regard the day as the length of time that the sun is above the horizon, we may say that at the poles the days and nights are each of six months' duration. If the sun is vertically above the equator, as it is during the equinoxes (q.v.), the days and nights are of equal length; if the sun is north of the equator, as in our summer, the days in the northern hemisphere are longer than the nights, and *vice versa*

Day, John, a sixteenth-century dramatist, who is mentioned as living in 1598, and is also mentioned by Ben Jonson. Of his known works are the *Blind Beggar of Bednal Green*, *Humour out of Breath*, and the *Parliament of Bees*, which is commended by Charles Lamb.

Day, Thomas (1748–1789), born in London, where his father was a collector of customs. He was educated at Charterhouse and Oxford, and inheriting a small fortune, he was called to the bar, and travelled on the Continent. He appears to have been impressed by the principles of Rousseau, and to have had a certain eccentric turn of mind thereby increased. He had two foundling girls educated, with the idea of marrying one of them, but the marriage did not take place, and he gave each a portion and married them to tradesmen. In 1778 he married a Miss Milnes. He was killed by a fall from a young horse, which he was trying to break in upon a system of his own. He is chiefly remembered as the author of *Sandford and Merton*, a book which has interested and amused many generations of boys.

Dayaks (Dyaks), the aboriginal and uncivilised inhabitants of Borneo, as distinguished from the civilised Mohammedan Malays settled on the coastlands. The name, probably connected with a root *daha*, "man," "people," has, as used by the Malays, the general meaning of "wild" or "savage," but is unknown to the natives themselves, who have no collective ethnical designation, each tribe or family group taking the name of the district or river valley occupied by it, or else of some noted chief living or dead. They are quite distinct both in appearance and speech from the Malays, the features and articulations being more delicate, the

expression more pleasant, the nose larger and more regular, the forehead higher, the complexion lighter, the physiognomy almost European, so that they must be grouped with the Battas of Sumatra, the Mentawey Islanders, the Bisayas of the Philippines, and many others in the Indonesian division of the Malayan populations. [INDONESIANS.] This applies, however. only to the pure Dayaks of the interior, who have hitherto preserved the racial type and customs intact, whereas the coast tribes have already been greatly modified by long contact with the intending Malays. Baron von Kässel, who resided several years in Borneo (1846–49), distinguishes five main groups:—1. The *Pari* of the east and north-east, who wear enormous copper ear-plugs distending the lobe down to the shoulders; 2. The *Biyaju* of the south and south-east, who tattoo the whole body; 3. The south-western tribes named from the districts occupied by them (Sambas, Landak, Sadong, Sarayak, and Sekayam); 4. The *Malayu-Dayaks* of the north-west, long associated with and partly assimilated to the Malays of Sarâwak and Brunei; 5. The nomads of the interior, three groups, the *Ott* or *Vutt*, *Puna*, and *Kanketta*, all speaking the same language, all tattooed over the whole body except the face, all noted head-hunters, and apparently cannibals. Till recently head-hunting was practised even by the coast tribes, and gave rise to a chronic state of warfare between all the Dayak populations; but since the spread of British influence it has fallen into abeyance throughout the northern districts, where the natives have become more settled, occupying themselves with agriculture, mining, and several industries, such as weaving, forging, and pottery. (*See* O. von Kässel, *Ueber die Volksstämme* Borneo's in *Zeitschrift für allgemeine Erdkunde*, 1857; A. R. Wallace, *The Malay Archipelago;* Reports of the British North Borneo Company, 1887–92.)

Dayton, the capital of Montgomery county, Ohio, U.S. America, 66 miles S.W. of Columbus, and at the junction of the Mad and the Miami rivers. It is an important and active industrial city, and is a centre of railway communication. It is well built, and has a court-house formed upon the model of the Parthenon. Its products are beer, cotton, oil, paper, machines and agricultural implements, and wool.

Deacon, in the Greek, Roman Catholic, and Anglican churches, the lowest of the three great orders of the clergy. (The two former churches, however, recognise an order of sub-deacons and minor orders.) It is related in Acts vi. that the Apostles, finding that the ministration of temporal relief to the poorer members of the church interfered unduly with their spiritual work, appointed seven deacons (Greek *diākŏnos*, helper) to attend to the former work. Philip and Stephen, the first martyrs, were among the members; but both also preach, and one administers the rite of baptism; in St. Paul's Epistles deacons are referred to as part of the Christian ministry, and in the first three centuries of the church's history the spiritual side of the deacon's work seems to have displaced the temporal. References to the office by the Fathers seem to indicate this, though there is much controversy as to their precise significance. The Council of Nicæa (325 A.D.) made a marked distinction between deacons and priests, and ordered that the former should be subject to the latter. In the English Church the diaconate is a first step to the ministry, the deacon being usually ordained priest after a year. Occasionally, however (though usually from conscientious scruples), men remain deacons throughout life, as also do sometimes in the Roman Catholic Church those whose work in life is secular rather than sacerdotal (*e.g.* those employed in some political capacity by the Vatican). The idea of an "Order of Deacons," who should not proceed to priest's orders, consisting of missionary clergy less highly educated than the ordinary Anglican clergy and nearer the type of the "evangelist" or "Scripture reader," has been occasionally put forward in the Anglican communion of late years, but not as yet with any definite result. Most of the Nonconformist churches in English-speaking countries holding that a broad distinction was meant by the Apostles to exist between priests and deacons, employ the latter as secular officers, who manage the temporal affairs of the church and occasionally preach, especially in rural districts and at the less formal religious meetings.

Deaconess, in the Primitive Church, was an elderly woman chosen to assist persons of her own sex at baptism, and apparently admitted to the office with some kind of religious ceremony. The office disappeared in the Western Church before the fifth century, though it continued till the twelfth in the Eastern. In 1836, however, Pastor Fliedner established a religious order of trained nurses at Kaiserwerth on the Rhine, which took the name, and many similar orders now exist in Protestant churches. The best known in England are perhaps the "Mildmay Deaconesses," whose headquarters are in North London. In the Anglican Church, however, sisterhoods bearing more resemblance to the Roman Catholic orders are more common. The Church of Scotland has formally recognised the office of deaconess.

Dead, BOOK OF THE, an ancient Egyptian work, in 106 chapters, describing in mystical language the adventures of the soul after death, and the texts it must quote to escape the torments of the lower world. Its nucleus was seemingly a collection of moral maxims, like the Proverbs of Solomon (a very ancient Egyptian work. known, from its discoverer, as the "Papyrus Prisse," is a similar collection), and is older than 3500 B.C.; but it contains many later additions (mostly glosses) of a mystical character, some as late as the Persian conquest. It seems to have grown with the myth of Osiris (q.v.). A critical recension has been undertaken by M. Naville.

Dead Beat means the property of a mechanical recorder by which it registers the required reading at once, without tedious oscillations of the needle or pointer. Dead-beat instruments are very

desirable in practical work, especially in cases where the effects to be measured are so transient as to be over before a slow-reading instrument could be observed.

Deadly Nightshade. [NIGHTSHADE.]

Dead Points, in mechanism, are those positions from which the machinery, if at rest, cannot pass without external force being applied. If the machinery is in motion, its inertia may carry it past those positions. It is one of the functions of a fly-wheel in machinery to apply such inertia.

Dead Reckoning, in navigation, is an estimation, without astronomical observation, of the position of a ship. It is found by keeping account of the distance shown by the log to have been run and of the course as steered by compass, and by rectifying these data with allowances for drift, leeway, etc. Dead reckoning is, of course, checked and corrected as often as good observations of the sun can be obtained.

Dead Sea, THE, a salt lake of Palestine, situate at the lower extremity of the Jordan valley, in lat. 31° 30′ N. and long. 35° 30′ E. The lake has borne at different times many names—the Salt Sea, the Sea of the Plain, Lake Asphaltites, and is called by an Arab name which signifies the Sea of Lot. One peculiarity of the Sea, as well as of the whole Jordan valley, is that they are below the level of the Mediterranean. There are many signs of volcanic action in the neighbourhood, such as the presence of lava, the casting up of lumps of asphalte, and the prevalence of earthquakes, and geologists consider the whole Jordan valley to be a crevice produced by volcanic agency at some very remote period of the earth's history. The Dead Sea is fed by the Jordan and other rivers, but has no visible outlet, and it is thought that it depends wholly upon evaporation for its diminution, a view which is supported by the fact of the water being extremely salt and containing 25 per cent. more salts of magnesia and soda than the ocean. Indeed, it has been described as a "huge basin of brine." The length is 46 miles by a width of from 5 to 9 miles, and the depth varies from 1,300 feet to from 3 to 12 feet in the south. The oval outline is broken by a promontory in the south-east. On the E. and W. are barren limestone cliffs with a height of 2,500 and 1,500 feet respectively, and on the S. is what is called the Ridge of Sodom, consisting of rock-salt, 7 miles long and 300 feet high. The clear blue water is very buoyant, owing to its high specific gravity. Fanciful stories have been told of the absence of life over and around the Dead Sea, but there seems little ground for them. The watercourses which pass through the limestone cliffs are bordered by vegetation. Both the N. and S. shores are occupied by level, swampy, and muddy flats.

Deaf and Dumb is the term commonly used to describe persons who, through deafness, are unable to hear the spoken words of others, and who, consequently, remain dumb. Deafness is the cause, dumbness the consequence. Thus the term "deaf and dumb" is a misnomer, for the deficiency is single, not two-fold, although in the result it affects the two organs of hearing and speech. The term "deaf and dumb" is that which is used in every European country, and has its equivalent in every Continental language; but the Americans have dropped the word "dumb," and now always speak of the "deaf" simply.

Children who lose their hearing at an early age through disease or accident, very soon lose the power of speech, and ought to be sent at once to a good school for the deaf. Such cases of acquired deafness ought to be treated separately, and not classed among the deaf and dumb.

Deafness is either congenital or acquired. Congenital deafness arises from some natural cause which deprives the child of hearing from its birth. Acquired deafness arises from disease, accident, or other causes. The deaf are divided into two classes—the totally deaf, and the partially deaf; the latter being subdivided into five classes: that is, into (*a*) those who perceive the human voice when it is used close to the ear, without being able, however, to distinguish the separate sounds; (*b*) those who can distinguish the vowels when they are loudly pronounced in the ear; (*c*) those who understand (but with difficulty) some words known to them when these are clearly pronounced in their ear; (*d*) those who, without effort, understand all that is clearly pronounced in their ear; and finally (*e*) those who can hear the raised voice, but not sufficiently well to follow general conversation, or to attend to what is going on in a class of hearing children. All those coming within this division are fit subjects for schools for the deaf and dumb.

Hearing children acquire speech by imitating the sounds they hear spoken by others; the deaf, unable to do this, remain dumb. Medical science being of no avail, the deaf have to find their solace in educational treatment. As we have to deal with want of hearing, a substitute has to be found for it, which in some cases is done by signs, in other cases by acquired speech and lip-reading. The eye in all cases has to perform the double duty of hearing as well as of seeing. The power of reading what others say, from the face and lips, is called lip-reading. The deaf child, like its hearing fellow-creatures, is taught to speak by imitation. There are, at present, three methods for teaching the deaf and dumb; first, the German, or Pure-Oral System, which teaches by articulation and lip-reading *exclusively;* secondly, the French or Sign-System, which employs artificial signs and a manual alphabet; and thirdly, the Combined System which tries to unite both the preceding ones, making use of signs for conveying instruction, and teaching articulation as an accomplishment. A fourth system, called the Aural System, makes use of hearing trumpets and other artificial means, with the partially deaf, with a view to develop the amount of hearing they still possess, and turn it to account as far as possible.

In Great Britain the proportion of the deaf, of all ages, to the whole population, is believed to be about 1 in 1,800. But the number has never been satisfactorily ascertained, for the means employed are not adequate, the information desired is not available, and parents are sometimes unwilling and

sometimes unable to report the facts required to the official persons making the inquiry. The first census of the deaf and dumb taken in this country was in 1851; and at successive intervals of ten years the inquiry has been repeated. The results of the fifth Decennial Census taken in 1891 have not yet been published; when they *are* made known they will be useful chiefly for the purposes of comparison, for no attempts were made by the authorities to extend or improve the returns in 1891, though the importance of doing so was strongly recommended and urged by the Royal Commission and other authorities. The number of deaf mutes at school in the public institutions of Great Britain in 1885 was, as nearly as could be ascertained, as follows:—

	Total.	Male Pupils.	Female Pupils.	Boarders.	Day Scholars.	Male Teachers.	Female Teachers.
England and Wales	1,941	1,058	883	1,412	529	61	101
Scotland - - - -	412	221	191	386	26	20	19
Ireland - - - - -	555	291	264	555	—	21	18
United Kingdom -	2,908	1,570	1,338	2,353	555	102	138
		2,908		2,908		240	

CENSUS RETURN.

	Total Population.	Deaf and Dumb.	Proportion of Deaf to whole Population.
1851 - - -	27,511,801	17,300	1 in 1,590
1861 - - -	29,321,288	20,311	1 in 1,432
1871 - - -	31,845,379	19,237	1 in 1,644
1881 - - -	35,023,639	19,518	1 in 1,794

There are about 36 institutions and schools throughout the United Kingdom.

The education of the deaf is only about one century old. We read of isolated attempts being made before the 18th century, in different countries, to instruct one or two deaf and dumb persons, but no concerted efforts are read of until the times of the Abbé de l'Epée in France, and his contemporary Samuel Heinicke in Germany. As a rule, the isolated efforts above referred to were looked upon as miracles, and died out, as all eight days' wonders do. In Spain Pedro Ponce (1520–84), a Benedictine monk, taught deaf mutes to speak, and in the following century another monk belonging to the same order, Juan Paulo Bonet, published a work on the subject, which has been translated into many languages, in which he gave an account of his experience as a teacher. His book contained a manual alphabet. It was published in 1620, and served as a guide to the Abbé de l'Epée, nearly 150 years later. Bonet, however, advocated oral teaching. De l'Epée was the first to use artificial signs and the manual alphabet as a means of communication and for conveying knowledge, and thus gave the manual alphabet and signs the character of a language. Bonet's fame spread, and his work was taken up by our countrymen. In 1648 Dr. John Bulwer published his *Philocophus, or the Deafe and Dumbe Man's Friend*, in which he speaks of a lip grammar which "may enable you to hear with your eye, and thus learn to speak with your tongue." Dr. William Holder published his *Elements of Speech, with an Appendix concerning persons deaf and dumb*, in 1669; and Dr. John Wallis, Professor of Mathematics in the University of Oxford, taught some deaf and dumb pupils with great success, and corresponded largely on the subject with his contemporary. Dr. John Conrad Amman, a physician of Haarlem, who published many valuable books, of which *Surdus Loquens* ranks foremost (1692). This small book, translated into many languages, is still of service to the teacher. Amman was a physician practising at Haarlem, where he successfully taught the daughter of one of his patients, and so great is his merit that in Holland, to the present day, the oral system is often called the Amman System. George Dalgarno, the author of *The Deaf and Dumb Man's Tutor*, which was published in 1680, and which is another book worthy of mention, is the probable inventor of the two-handed alphabet in use in our English institutions. It was not, however, until 1765 that the Abbé de l'Epée made the instruction of the deaf a special branch of work by collecting a few deaf children and opening the first school. Samuel Heinicke did the same in Germany; and the first school in the United Kingdom was started by Thomas Braidwood at Leith, near Edinburgh. Braidwood removed to Hackney in 1783, and his nephew and assistant, Dr. Joseph Watson, became the head-master of the London Asylum, opened in 1792. As soon as the fact was ascertained, without a doubt, that deaf and so-called dumb children could, by means of instruction, be rendered useful members of society and industrious, respectable citizens, British philanthropy came to the fore, and we can now boast of having a large number of institutions and schools for the education of the deaf in every part of the kingdom. What State aid has accomplished in other countries, Britain has hitherto done by its own philanthropy. It is to be hoped, however, and expected, that Great Britain will soon cease to be the exception to the rule of all other nations where State contributions step in to help private efforts to make the education and instruction of the deaf as complete as possible. The systems followed in Great Britain until 1867 were the French System and the Combined System, excepting in a very few cases where private persons had their children taught by private tutors. It was not until 1867, as just mentioned, that, at the instance of the late Baroness Mayer de Rothschild and her friends, the Pure Oral System was introduced into Great Britain. The Baroness founded a Home in London for poor Jewish deaf mutes, and having heard of the results of the oral system abroad, resolved upon securing for her protégés the most

improved instruction she could obtain. This was the means of bringing to England Mr. William Van Praagh of the Rotterdam school to undertake the work. The success which attended the Pure Oral System was so marked that the late Baroness and her friends resolved to extend its advantages to the community at large, and as a result she, with the co-operation of a very influential committee, founded the Association for the Oral Instruction of the Deaf and Dumb in 1870, and the Normal School, and Day Training College for Teachers of the Association were opened on the 15th July, 1872, under the directorship of Mr. Van Praagh. In 1877 the success of the work of the Association led to the formation of a somewhat similar society by Mr. St. John Ackers with a Residential Training College at Ealing.

The spread and adoption of the Pure Oral System since 1867 has been most marvellous. Originally limited to Germany and Holland, it has spread rapidly through Italy, has become the Government system of France, and has been introduced in many parts of America, where only recently Dr. Graham Bell, of telephone renown, has established a society for the encouragement of teaching speech in schools for the deaf. The International Conferences at Paris, and particularly the one at Milan in 1880 and the last one at Brussels in 1883, have most fully established the superiority of the Pure Oral System on the Continent. English teachers have held conferences also, which have tended to encourage the adoption of the Pure Oral System. It was crowned with almost unanimous approval at Milan, and was immediately adopted in other places, even in the three national subsidised institutions of France, the cradle of the Sign or French System. In 1886 a Royal Commission, under the presidency of Lord Egerton of Tatton, was appointed to inquire into the education of the blind and the deaf and dumb. The Commission carried out its work with the utmost perseverance and energy, and made most searching inquiries into the education of the deaf at home and abroad. Its report is most exhaustive and complete, and the twenty-seven "recommendations" which it made are of great practical value. No. 9 recommends "that every child that is deaf should have full opportunity of being educated on the Pure Oral System. In all schools which receive Government grants, whether conducted on the Oral, Sign and Manual, or Combined System, all children should be, for the first year at least, instructed on the Oral System, and after the first year they should be taught to speak and lip-read on the Pure Oral System, unless they are physically or mentally disqualified, in which case, with the consent of the parents, they should be either removed from the Oral department of the school or taught elsewhere on the Sign and Manual System in schools recognised by the Education Department. The parent shall, as far as practicable, have the liberty of selecting the school to which his child should be sent."

The supporters of the Pure Oral System claim for it perfect success if carried out exclusively, and entirely apart from other systems. And, although the Pure Oral System is not adopted in Britain in all our schools, one scarcely finds a single school now in which articulation is not introduced and carried on to some extent. The Pure Oral System uses the eye as a substitute for the ear, and lip-reading is the very "backbone of the system." It is of the greatest importance that a deaf child should be made to understand even before it can speak, just as hearing children understand before they can articulate. Every sound which we emit produces vibration of the face and throat, as well as of the lips. Sight and touch are therefore used to teach the deaf child to reproduce sound. The child is taught gradually and successively to inhale and exhale, to emit vowel sounds, to combine the vowel sounds with consonants, and the combined sounds into words. The meanings of these words are illustrated by objects or pictures. Instruction of the deaf consists in the teaching of articulation and the teaching of language together. They continually go hand in hand. The deaf and so-called dumb children are taught to speak, lip-read, to read and write, simultaneously.

When a teacher pronounces a sound the child imitates it—that is, he *speaks;* he is taught to recognise it when spoken—he *lip-reads;* he is taught the sound in letters—he *reads;* and imitates them on the blackboard, the slate, or paper—he *writes.* The *modes* of teaching on the Pure Oral System may differ sometimes in detail, but the *principles* are always the same. They vary according to locality, length of the course of instruction, and from other causes. The principles are—that from the very outset lip-reading and articulate speech must be the sole and exclusive means of conveying language to the child; that every effort must be made to make lip-reading as perfect as possible; that no other means of conveying language to him are to be allowed—no signs whatever, except the so-called natural signs in the earliest stages, and not much writing. Speech must become to deaf children what it is to hearing children—it must be part of their existence; and lip-reading must be practised to such an extent that it becomes a natural process equivalent to hearing. Every deaf child, before going to school, has a command of natural signs, which must not be extended beyond pointing, and must never on any account degenerate into *artificial* signs.

Natural signs are easily distinguished from artificial ones; natural signs being understood by everyone, artificial ones only by the initiated. The French System makes use of the natural signs of the deaf, but develops the natural ones into artificial ones, and uses them and the manual alphabet as means of instruction. The Combined System uses both manual alphabet and speech, as well as signs; but specialists are of opinion that the French System—teaching by signs—is even preferable to a Combined System, as it is impossible for a deaf child to watch movements of the hands and movements of the face at the same time, and he therefore prefers the easier way, that of signing: speech and lip-reading have, therefore, little chance of success. A Pure Oral teacher looks upon signs as weeds in his garden, and uses every means to encourage spoken language exclusively. The Pure Oral System

he upholds as preferable because (1) it emancipates the deaf mute by giving him the great gift of speech ; (2) because it develops the power of understanding what others say ; (3) because it teaches language in the natural way ; (4) because it extends his means of acquiring knowledge, since everyone whom he sees talking and who converses with him becomes to him a teacher, whilst at the same time it destroys the isolation of his life, and makes him better fitted to mix in general society.

The education of deaf mutes is carried out in boarding schools and in day schools. Each of these systems has its ardent partisans who vigorously defend their own cause. Those in favour of Boarding Schools say that deaf children want constant supervision : the friends of the Day School System maintain, on the other hand, that their pupils have a larger field of observation, and derive much benefit from daily mixing with the outer world.

Deaf boys and girls, after having finished their school education, are apprenticed to suitable trades, like hearing boys and girls. The kind of occupation for which a deaf boy is fitted depends, to a great extent, upon the class of family to which he belongs ; yet care must be taken not to apprentice him to anything that is subject to change of fashion, but to an industry of some permanent character.

Separate and independent societies exist throughout the country to look after the spiritual and temporal welfare of the ADULT deaf and dumb. The headquarters of these organisations for London are the offices of the Royal Association in Aid of the Deaf and Dumb, St. Saviour's, 419, Oxford Street, where all information on the French or Manual System may be obtained. There are two Colleges for the Training of Teachers of the Deaf and Dumb on the Pure Oral System, a Day Training College at 11, Fitzroy Square (opened 1872), and a Residential Training College at Ealing (opened 1878), besides which there exists an Examining College of Teachers, at Stainer House in Paddington Green (opened 1886), which gives certificates to teachers of all systems.

Information on these subjects, with lists of publications, etc., may be obtained from the Association for the Oral Instruction of the Deaf and Dumb, 11, Fitzroy Square, London, W.

Deaf and Dumb, LEGAL RIGHTS OF. A deaf and dumb person cannot serve as a juryman, nor can he serve in the army or navy. If he has received a good education, and knows the importance of an oath, his evidence as a witness is admissible, either by signs, through an interpreter, by writing, or by spoken words. Both in England and Scotland they may make wills ; and an instance is on record (May, 1861) in which a will was made by a lady born deaf who became blind also, at the age of 60, and whose will, made at 70 years of age, when contested and challenged, was conclusively proved and established in the Court of Probate at Westminster. A strange case has arisen recently in one of the minor courts in Scotland where the defendant, being deaf and not answering to his name simply from not hearing it, though he *was* present, was considered to have treated the Court with contempt by his absence, and the verdict was given against him. It is hoped that efforts may be successfully made to correct this manifest injustice.

Deafness. [EAR.]

Deák, FRANCIS (1803–1876), a Hungarian politician, born at Kehida, in Szalad, of a very ancient noble Magyar family. He studied law at Raab, which town he represented in the Diet of 1832. By his firmness and inflexibility of principle, conjoined to great amenity of manner and the faculty of yielding upon secondary points that did not involve essential principles, he became the chief instrument in reconciling the Hungarian kingdom with the Hapsburg dynasty. In 1848 he was Minister of Justice in the Ministry of Count Batthyany, but on the access to power of the more advanced party he retired into private life. In the same year he had been chosen to draw up an address applying for a Constitution, and, though the application proved unsuccessful, the Emperor sent for him to consult as to what Hungary really required. In 1861 he represented Pesth in the Diet. After the war of 1866 a demand was again made for a Constitution, and Deák's moderation in demanding only what had been asked for before caused it to be successful. He died at Buda-Pesth.

Deal, a municipal borough and watering-place on the E. coast of Kent. Though not one of the original Cinque Ports, it became a "limb" of them and shares their privileges, being a corporate member of Sandwich. Between the N. and S. Forelands, it is 89 miles from London and 6 S.E. of Sandwich, to which parliamentary borough it formerly belonged. The industries of Deal took their rise in the fitness of its situation for supplying the wants of vessels lying in the Downs between the coast and the Goodwin Sands. The Deal boatmen, called "hovellers," are renowned for their fearless daring in carrying aid to ships in distress. Of three castles built by Henry VIII. for the protection of the coast, one—Sandown—has been demolished ; another—Walmer—2 miles S., is now the official residence of the Lord Warden of the Cinque Ports ; and Deal Castle is the residence of the Captain. There is a fine beach, and an iron pier was built in 1864. Perkin Warbeck landed here in 1495.

Deal Fish (*Trachypterus arcticus*), a North Atlantic deep-sea fish of the Acanthopterygian family Trachypteridæ, containing the Ribbon-fish (q.v.). The body, which in large specimens may be six feet long and a foot high, is very thin and brittle ; colour, silvery-white ; dorsal and caudal fins red.

Dean (Lat. *decanus*, from *decem*, ten), originally the head of a body of ten. Thus in early England the tithings, or subdivisions of the hundred for the administration of justice, had each its dean. Similarly the bishops divided their dioceses into groups of ten parishes, over each of which there was a dean (called in the towns, dean of the town, and in the country, rural deans). Again, in monasteries and collegiate and cathedral foundations, deans were appointed to see after the internal discipline. At present the colleges at Oxford and

Cambridge each possess one (or sometimes two) officers charged especially with the maintenance of discipline, who in most cases are termed deans. Probably because their functions are supposed to give them special knowledge of the character of the undergraduates, they are charged with the ceremonial duty of presenting them for degrees. The dean of a cathedral chapter acts as its chairman, and exercises a general supervision over the corporate property and the fabric and services of the cathedral. The office now is usually supposed to be one of learned leisure, specially fitted for those clergy who have gained distinction as scholars. Rural deans, in the absence of the bishop, induct the clergy who have been instituted to livings, and report to the Archdeacon on the state of churches and churchyards. The *Dean of Battle Abbey* (in Sussex) has no chapter, but has an ecclesiastical court and is exempt from the jurisdiction of the bishop of his diocese. Guernsey and Jersey (doubtless from their insular position) possess Anglican deans (who are also rectors of parishes) with some judicial power and special disciplinary functions. Among ecclesiastical deans with judicial power only, the Dean of Arches (whose office is now absorbed in another) was the most important. The term dean is also sometimes applied to the senior member of a body, *e.g.* the Deans of the Faculties in some universities.

Dean, Forest of, is a hilly region of 34 square miles in West Gloucestershire, between the Severn and the Wye. An ancient royal forest, it was almost disforested by Charles I., to be again made forest after the Restoration. It is for the most part Crown land, and half of it is set apart for the growth of timber for the navy. It is divided into six walks, and is under the Commissioners of Woods and Forests, with a staff of officers, among whom are the verderers, now needless, as there are no deer, it being found, perhaps, that deer and miners would not flourish together. For the free miners of the Forest of Dean are a noted body, with many privileges, subject to certain rights of the Crown, which are in some cases commuted for a royalty. The miners are supervised by a "gaveller." Besides coal, the forest produces iron, and there are quarries of building-stone and of stone fitted for grindstones, rollers, and troughs.

Deane, Richard, English naval and military commander, was born in 1610, and, after having served with distinction in the Parliamentary army, was, in 1649, appointed one of the Admirals and Generals-at-Sea. In 1653 he was joint-admiral with Blake and Monck against the Dutch, and fought on February 18 in the three days' battle of Portland. In the battle of June 3, following, off the coast of Essex, Deane was cut in two by a cannon shot.

Death. Many attempts have been made to classify the modes in which death may occur. Of these the most celebrated is that of Bichat, who maintained that in all instances death may be referred to one of three categories—viz. death beginning at the head, death beginning at the heart, and death beginning at the lungs. Bichat's classification is, however, open to criticism in certain particulars. Death returns are in this country usually classified under five heads, as follows: Zymotic disease, including such items as scarlet-fever, measles, etc.; constitutional disease—*e.g.* gout, phthisis; local disease, as for example apoplexy, bronchitis, Bright's disease, etc.; developmental disease, including such causes as premature birth and old age; and, lastly, violent deaths. Much might be written on the subject of the signs of death. It must suffice here to enumerate the chief of these, which are—cessation of the circulation as indicated by stoppage of the pulse-beat and absence of the heart-sounds; cessation of the movements of respiration; loss of body-heat; other matters which have great medico-legal importance, such as the condition of the eye, skin, and muscular system. (For further information concerning the last-named, *see* Rigor Mortis.)

Deaths, as well as births and marriages, must be registered. Where there has been no news of a person's existence for a term of seven years, and no explanation forthcoming, the law *primâ facie* presumes that he is dead; but that presumption does not in any way fix the time of death, of which strict evidence must be given by the party who derives any interest thereby. (For Duties on, *see* Probate, Legacy.)

Death, Civil, formerly took place when anyone was outlawed or attainted, for he thereupon lost (subject to some exceptions) his civil rights and capacities, and became, in fact, dead in law (*civiliter mortuus*). By a statute passed in the present reign (the 33 and 34 Vict., c. 23) it is provided that after the passing of that Act no confession, verdict, inquest, conviction, or judgment of or for any treason or felony or *felo de se* shall cause any attainder or corruption of blood or any forfeiture or escheat.

Death Rate. It is usual to state the number of deaths (or births) occurring in any district as being so many per 1,000 per annum. If the death-rate is calculated for a period less than a year, the deaths are still estimated at so many per annum, the figures given being arrived at on the assumption that deaths continue to occur for a whole year at the same rate as they do actually occur during the observed period. Thus a weekly death-rate of 21 in London means that if people died during one year at the rate at which they die in the particular week under consideration, then in every 1,000 persons there would be 21 deaths. The gross death-rate in any district is often a somewhat imperfect index to the actual mortality associated with the district. Two main corrections may be applied to the gross death-rate—viz. the correction for non-residents (those dying within the district who do not really belong to the district should be excluded from the return, while on the other hand those belonging to the district who die outside it should be included in the return); again, there is the correction for age and sex distribution (this is an important correction, for the liability to death differs in the two sexes, and there are marked

divergences in death-rates at different periods of life). The mean annual death-rate in England and Wales for all ages for the ten years 1871-80 was 21·4.

Death's Head Moth (*Acherontia atropos*, Linn.) is the largest of the British butterflies or moths (Lepidoptera), and has an expanse of wing of about six inches. The general colour is dark brown, but the hinder pair are ornamented with black bands. There is a white patch on the thorax, with a couple of dark dots upon it: from the

DEATH'S HEAD MOTH. (*Acherontia atropos.*)

supposed resemblance of this to a skull the moth has derived its popular name and the legends associated with it. Popular interest in the moth is also aroused by the fact that it is one of the few members of that group that can make a noise: when frightened it can emit a distinct squeak. It is more common than usually supposed, but, as it only flies at night, escapes observation. Potatoes and the deadly nightshade (*Atropa*, whence its specific name) are its favourite food, and its larva is frequently found in the Kent potato-fields.

Deathwatch, a small beetle, about a sixth of an inch in length, that lives in old wood, and is in the habit of striking its head against the walls of its burrow: it thus makes a slight ticking noise, from which it has derived its popular name. Its name is *Anobrium domesticum*.

De Bary, HEINRICH ANTON (1831–1888), a German botanist born at Frankfort-on-Main. Educated at Heidelberg and Berlin, he began in 1853 to practise as a doctor at Frankfort, but the next year became a *privat docent*, or University lecturer, at Tübingen. In 1855 he was appointed Professor of Botany at Freiburg, and in 1867 he went to Halle. In 1872 he became rector of the University of Strasburg, where he remained till his death. He was an authority upon fungi, and his *Lectures on Bacteria*, *Morphology of Plants*, and *Comparative Anatomy of Phanerogams and Ferns* have been translated into English.

Debenture Stock is part of the capital stock of a railway or other company which is lent out on mortgage and secured on a specified part of its property. The deed assigning this property as security is called a debenture (Latin *debeo*, I owe). Frequently, for convenience of transfer, the debenture stock is represented by a number of debentures, each of relatively small amount (commonly £100). By the Companies' Clauses Acts, 1862, debenture holders who do not receive their interest have power to require the appointment of a receiver (q.v.).

Debit. [BOOK-KEEPING.]

Debreczyn, a Hungarian town on a plain 130 miles east of Pesth, the largest and most populous town after Pesth, but having rather the appearance of an immense village, the town proper being separated from the suburbs by a palisade. There are some fine buildings, among them being the Protestant college, which has a good library. It is the great headquarters of the Protestants of the country, and the greater part of its population are Magyar Protestants. In the neighbourhood large herds of cattle are reared, and there is a good trade in cattle and grain. There are also manufactures of soap, saltpetre, sausages, hams, and tobacco pipes. At the revolution of 1849 the National Diet took refuge here after the capture of Pesth.

Debt, a legal obligation to pay money, arising out of a contract, express or implied. In general, whenever a contract is such as to give one of the parties a right to receive a liquidated sum of money from another, as in the case of a bond for the payment of money, or an implied promise to pay for goods supplied so much as they shall be reasonably worth—a debt then exists between these parties; while if the demand be of wholly uncertain amount (as, say, for *damages* arising from negligence or otherwise) it is described not as a *debt*, but as a claim for *damages*. As debts may thus arise from contracts, and the contracts may be either specialty contracts or simple contracts, so the debts resulting therefrom are termed either *specialty debts* or *simple contract* debts. Debts may, however, arise not only by deed or simple contract, but by matter of record, and in that case they receive the appellation of judgment debts or *debts of record*. A debt of record is a sum of money appearing to be due upon the evidence of a court of record; thus it may be due upon a *statute merchant* or *statute staple*, or upon a *recognisance*, which latter is an obligation of record, entered into before some court or magistrate duly authorised, whereby the party bound (the recognisor) acknowledges his debt to the Crown or to a private person (the recognisee) as the case may be, to be void if he shall do some particular act—as if he shall appear at the assizes, keep the peace, pay a certain debt, or the like. Judgment debts are also, as already mentioned, debts of record, for when any sum is, in any action in any court of record, adjudged to be due from one party to another, whether that sum was originally liquidated so as to constitute a *debt* between them, or was fixed and ascertained for the first time by the verdict of a judge or jury, the claim having been originally in the nature of *damages*, that is a judgment debt, and a debt of record. Debts may also arise other than from contracts and judgments, as where an Act of Parliament affixes a penalty to some particular offence which is made recoverable by an informer; any one committing such offence becomes indebted

in the amount of the penalty to the informer, so soon as the information is laid. Also anyone who has never contracted at all to pay a rent charge issuing out of land may become liable therefor as for a debt, and that merely by reason of his having taken and enjoyed the land out of which the rent charge issues. And practically there is a contract implied by law in all such cases of liability. Debts may be attached. [ATTACHMENT.] Debts are now assignable at law so as to enable the assignee to sue for them in his own name, but express notice must be given to the debtor, trustee, or other person from whom the assignor would be entitled to claim such debt; formerly he could only sue in the name of the debtee. Debts are further distinguished as *secured* and *unsecured*. By the Judicature Act, 1873, it is provided that in the administration of an insolvent estate of a deceased person and in the winding up of an insolvent company the same rule shall prevail as to the rights of secured and unsecured creditors, and as to debts and liabilities provable, and as to the valuation of annuities and future and contingent liabilities respectively as may be in force for the time being under the law of bankruptcy with respect to the estates of persons adjudged bankrupt. [BANKRUPTCY.]

Débût (French), a first appearance before the public, commonly used of actors. A *débutante* in London society is a young lady who has just "come out," *i.e.* has been, or is shortly to be, presented to the Queen at a Drawing Room (q.v.).

Decagon, a closed figure whose sides are ten straight lines. If the sides are all equal and the angles between consecutive sides equal also, we have the regular decagon.

Decalogue (Gk. *deka*, ten; *logos*, statement), the Ten Commandments (Exodus xx.).

Decameron (Greek *dechēmerus*, *dechāmerus*, lasting ten days), a book of one hundred tales, supposed to be related in ten days at a country house during the plague at Florence, written by Boccaccio (q.v.).

Decamps, ALEXANDRE GABRIEL (1803–1860), a French painter born at Paris. At an early age he was sent to an out-of-the-way part of Picardy, and here—so he tells us in his autobiography—he forgot his Paris life, learnt bird's-nesting and orchard-robbing, and contracted that "grain of savagery" which never left him. He studied in a desultory sort of way, and his style gained in individuality what it lacked in finish. He did much lithographic drawing, and in 1824 he spent a summer in Switzerland without much result. He then went to the East, and afterwards produced many Oriental subjects, conspicuous among which are *Les Baigneuses* and *La Lecture du Firman*. He also produced a series of notable political caricatures, and an amusing set of monkeys imitating various human actions. His masterpiece has been considered the *Defeat of the Cimbri*, produced in 1834, which is sometimes put alongside Delacroix's *Liberté* and Delaroche's *Cromwell*. In 1839 he was made chevalier, and in 1851 officer of the Legion of Honour. He was killed in a hunting accident at Fontainebleau. He was a great colourist, and a good manager of light and shade, and had a quick method of working, his idea being at once formed and flowing as it were from his brush. "Manu promptus" one of his critics has said of him.

De Candolle, the name of four generations of botanists, the first of whom was AUGUSTIN PYRAMUS DE CANDOLLE, who was of Provençal descent, and was born at Geneva in 1778. He studied at Geneva, where Vaucher directed his attention to botany, and at Paris. where he gained the friendship of Jussieu, Cuvier, Biot, and Lamarck, and graduated as M.D. in 1804. In 1799 he published *Historia Plantarum Succulentarum*, and between 1803 and 1815 the third edition of the *Flore Française*, in the introduction to which he set out his natural system of classification. In 1807 he was appointed professor of botany at Montpellier, and in 1816 at Geneva, a post he retained till, in 1834, he was succeeded by his son Alphonse. From 1824 he devoted himself to the great exposition of his system in a Species Plantarum entitled *Prodromus systematis regni regetabilis*, of which he executed seven volumes, the completion having only recently been accomplished by his son and grandsons. He also laid the foundations of one of the largest herbaria in the world. He died at Turin in 1841. Augustin de Candolle shares with the Jussieus the honour of establishing the natural system in place of the artificial system of Linnæus.

Decantation, an operation in which a solid substance is separated from a liquid in which it is suspended, by allowing the solid to subside—pouring off the liquid—refilling with water or other liquid—and repeating the process several times.

Decapoda, the name of two orders of Invertebrates—one of Crustacea and the other of Cephalopoda. (1) The former is the better known of the two sub-orders of the Podophthalmata or "Stalked-eyed Crustacea," and it includes the crabs, lobsters, prawns, and many of the most familiar larger English crustacea. The characters of the order are the fusion of the thoracic somites into a distinct head and the fact that the five last pairs of feet on the thorax are seven-jointed and of but one branch (*i.e.* are uniramose). It is from these five pairs of similar and approximately equal legs that the class derives its name. The branchiæ or gills are borne on the legs or the sides of the body, and are enclosed in a special cavity. The head and thorax are protected by a strong shield known as the cephalothorax; in the Brachyura the abdomen is turned up under the body, and is therefore also protected by the carapace. The Decapoda differ so much among themselves, and the order includes so many important crustaceans, that further details are given under the sub-headings:—There are two sub-orders, the Macrura or "long-tailed" group and the Brachyura or "short-tailed." The former includes the lobster, crayfish, shrimps, prawns, hermit crabs, tree crabs (*Birgus*), etc. The Brachyura includes the true crabs, the sponge crabs (*Dromia*),

the land crabs (*Gecarcinus*), etc. To each of these reference should be made. (2) Cephalcpoda Decapoda, a sub-order of the Dibranchiata or two-gilled Cephalopods. In this group the animals have eight equal arms and two longer arms or tentacles with expanded ends; the function of the latter pair is reproductive. Correlated with the possession of these tentacles are the presence of fins and an internal skeleton and the fact that the suckers on the arms are stalked or "pedunculate." The Decapoda are divided into four families:—The *Belemnitidæ* or Belemnites (q.v.), which are all extinct; the *Spirulidæ*, containing *Spirula* (q.v.), a small form common in Southern seas, which is provided with a delicate spiral internal shell; the *Ægopsidæ*, a primitive family, with an eye of which the cornea is perforate; *Ommastrephes* is the best known genus. The last family is the *Myopsidæ*, in which the eye is closed; it contains the sub-familics *Sepiadæ*, with the Cuttle-fish (q.v.), and the *Teuthidæ*, with the Calamaries (q.v.) or Squid as its best known representative.

Decatur, STEPHEN, an American naval officer, was born at Sinnepuxent, Maryland, in 1779, and entered the navy in 1798. He served on the coast of Central America, and afterwards, in 1804, brought himself into notice in the Mediterranean by cutting out an American frigate, the *Philadelphia*, which had been captured and carried into Tripoli. In the war of 1812 he had command as commodore of the frigate *United States*, 44, in which he met, and after a smart action, took the British frigate *Macedonian*, 38. In this exploit he had the advantage of largely superior force. He afterwards commanded the *President*, 44; and in her, after leaving New York harbour, he was chased by a British squadron, and engaged, especially by the *Endymion*, 40, and then by the *Pomone*, whereupon, having lost heavily, he struck. This was early in 1815, and at the very end of the war, at the conclusion of which Decatur, with a squadron, proceeded to the Mediterranean and there executed reprisals against the Dey of Algiers. Upon his return he was appointed Commissioner of the navy. Commodore Barron, whom in 1807 he had superseded, and at whose trial he had subsequently assisted, appealed to him in this capacity for reinstatement in the service. Barron had been found guilty of having surrendered the *Chesapeake*, and Decatur, from principles of honour, bitterly opposed the reinstatement. A quarrel ensued, and a duel resulted on March 22, 1820. At the meeting both men were seriously wounded at the first fire, and Decatur died a few days afterwards.

Deccan (from Sanscrit for *south* or *right*, since in turning to the east a worshipper had the south on the right) was a name given before the Mussulman conquest of India to the district S. of the Vindhya Hills, and then to the tract lying between the Nerbudda and the Krishna, from lat. 16° to 23° N. The name is historically rather than politically significant. Its large population is of very mixed origin.

Deceased Wife's Sister. [MARRIAGE.]

December (Lat. *tenth*), the last month of the year. The name is due to the fact that the Roman year began with March, till the reform of the Calendar by Julius Cæsar.

Decembrists, or DEKABRISTS, the participators in the Russian revolutionary outbreak of December 14 (26), 1825. The movement, although suppressed after a bloody scene in St. Petersburg in a single day, was a turning point of modern Russian policy. A secret commission, presided over by the new Czar's younger brother Michael (to whose presence is credited the loyalty of the artillery), condemned five of the leaders—Pestel, the poet Rileyef, Muravief-Apostol, Bestiazhef-Riumen, and Kakhovski—to be hanged; many others were banished. An amnesty on the coronation of Alexander II. liberated some of these exiles, and the memoirs of Baron Rosen and several others have been published in Russian. Almost half the noble houses were implicated in the revolt; few were quite unsympathetic. It had also a markedly democratic character. Since the fall of Napoleon, Alexander, now a convert to the ideas of the Metternich school, had been more and more dominated by reactionaries like Araktscheyef, hated as founder of the military colonies, and orthodox fanatics like Photi. In 1822 freemasonry was suppressed (Colonel Batenkof, one of the Decembrists, had been president of the Siberian lodges), and all but the strictest of religious societies were treated similarly. The censorship and regulation of universities became severer. On the other hand, since the granting of a constitution to Poland (1815), and the long stay of the armies in the West, the desire for reform, constitutional government, and the abolition of serfdom had grown rapidly. The death of Alexander, the mysterious renunciation of Constantine (who had married a Polish Roman Catholic lady), and the succession of Nicolas, gave at last an opportunity for an open demonstration. But many distinguished liberals, like Prince A. A. Suvorof (then in the Guards), would not go to this length; and some, like Prince Wyasemski, more interested in literature and the arts than politics, even continued in office afterwards. The result meant the complete loss of the already limited political power of the noble and cultured class. The successful reactionaries made short work of the remnants of Russian liberalism. Literature and art became mere appendages to court life. The Arsamass, a coterie of poets and writers like Pushkin, Griboiedof, and the Turgeniefs, was suppressed; the power of secret police surveillance was re-established; the famous "Third Division" became the most vital branch of the Government; and all the circumstances arose out of which in the next generation "Nihilism" was born.

Decemviri, or DECEMVIRS (Lat. *ten men*), the name of various committees of ten in ancient Rome. The best known is that elected in 451 B.C. to revise and codify the laws in consequence of the disputes between patricians and plebeians. At the expiry of their year of office a fresh commission was elected, Appius Claudius (q.v.) being the

only member who had served on both. These behaved very tyrannically, and the decision of Appius Claudius in the case of Virginia led to their overthrow. The laws they drew up formed the twelve tables, the most ancient body of Roman laws. Another (permanent) body of decemvirs had the care of the Sibylline books (q.v.).

Deciduous, a term applied to all organs of plants that fall off early. The stamens are generally deciduous, falling off when the pollen is discharged; the petals are so also, falling after pollination; the sepals are so in some cases, as in the cherry, though not so in others, as in the apple, gooseberry, or tomato; the whole of a male inflorescence or catkin (q.v.) often is so after the discharge of the pollen, as in the hazel; and sometimes these branches, when shed, bear one or two foliage-leaves, as in willows. The winter bud-scales or *perulæ* are commonly deciduous, as are also the stipules in some cases where they serve the same purpose. Leaves are termed deciduous when they fall before the unfolding of a fresh crop, so that the plant is left with bare boughs. The larch and the deciduous cypress (*Taxodium*) are exceptional among gymnosperms in being deciduous; but among angiosperms it is the rule for the trees and shrubs of the cooler temperate and arctic zones to be so. Some plants are only deciduous when the winter is severe, as in privet. The fall of the leaf (q.v.) has the effect of checking the growth of the plant, and so bringing about the arrangement of wood in annual rings. [Evergreen.] Deciduous trees are, though generally rare, common in England; in most countries deciduous trees are the exception.

Decimal Fractions, in arithmetic, a system of expressing fractional portions of unity by means of a series of fractions, the denominators of which are powers of ten. Thus, $\frac{7}{16}$ may be represented as $\frac{4}{10} + \frac{3}{100} + \frac{7}{1000} + \frac{5}{10000}$, or in the usual abbreviated form ·4375, the position of each digit after the decimal point telling us the magnitude of the denominator of the corresponding fraction. Any number may be so expressed, though it sometimes happens that simple fractions demand a long series of decimals. Thus, $\frac{5}{128}$ is equivalent to ·039375, and $\frac{13}{99}$ is ·13131313 . . . , the digits 1 and 3 alternating for ever; that is to say, certain fractions like the latter demand an infinite series of decimals to be exactly expressed thereby. Such recurrence is signified by placing dots over the first and last figures of the set that have to be repeated; the above recurring decimal is written $\cdot\dot{1}\dot{3}$, the decimal ·103103103 . . . is written $\cdot\dot{1}0\dot{3}$, and 4·35732732732 . . . is written $4{\cdot}35\dot{7}3\dot{2}$. There are simple rules for the conversion of vulgar fractions into decimals and for the reverse process. These rules are based on elementary considerations of fractions, and need not here be given. The use of decimals has distinct advantages; the processes of addition and subtraction may be effected much more readily with them than with vulgar fractions; different magnitudes may be compared by simple inspection when expressed as decimals. Thus, the relative values of the fractions $\frac{22}{7}$ and $\frac{355}{113}$ are readily seen when they are brought to the forms 3·14285 . . . and 3·14159 . . . respectively. In multiplication of decimal fractions one operation alone is necessary, whereas with vulgar fractions two are requisite. Nevertheless the decimal operations are sometimes more tedious, and as stated above simple ratios frequently require to be expressed as complex decimals.

Decimal System, a method of expressing weights and measures in units that are in the ratios 1000, 100, 10, 1, $\frac{1}{10}$, $\frac{1}{100}$, and $\frac{1}{1000}$, to each other. In the French or metric system we have, for example, the unit of mass, one *gramme*. From this are derived by repeated tenth-multiplication the *deca*gramme, *hecto*gramme, and *kilo*gramme; and by repeated tenth-division the *deci*gramme, *centi*gramme, and *milli*gramme. Throughout the system the Greek prefixes denote multiples of the unit, and the Latin prefixes denote submultiples thereof. Thus a millimetre is the thousandth part of a metre, the hectometre is a hundred metres, and a decigramme is the tenth of a gramme. [Metric System.]

Decimation (Latin *decimus*, tenth), the killing of every tenth man (usually drawn by lot) in a regiment or military division guilty collectively of some grave offence, *e.g.* mutiny. The practice is a Roman invention, said to have been revived by Crassus (q.v.) after long discontinuance. Instances are known under the Roman Empire, and it has been occasionally resorted to in modern times.

Decipium, a rare metallic element, the existence of which, in the mineral Samarskite, was indicated in 1878 by Delafontaine.

Decius, Cneius Messius Quintus Trajanus (200–251), a Roman Emperor born in Lower Pannonia. In 249 the mutinous army of Mæsia made him Emperor against his will and forced him to march against Philippus, the then Emperor, whom he defeated and killed near Verona. His reign of two years was chiefly occupied in fighting against the Goths, and he was killed in battle with them owing to the treachery of his successor, Gallus. His home policy was to restore the Rome of former times, and in pursuance of this he began the seventh persecution of the Christians, in the course of which the Bishops of Rome, Antioch, and Jerusalem were killed, and Origen was tortured.

Decken, Karl Klaus, Baron von (1833–1865), an African traveller born at Kotzen. He was of good family, and was educated at the Gymnasium of Lüneberg, from which he passed to the Cadets' College of Hanover, and then entered the army as lieutenant of Hussars. Tiring of the army after 10 years he entered upon his career as a traveller, and started for Nyassa. Owing to the treachery of his guide he was obliged to return. In 1861 he went to Kilimanjaro with an Englishman named Thornton, and in 1862 he climbed it to a height of 14,000 feet. In 1864 he came to Europe to organise an expedition to explore the rivers of the east coast of Africa. His steamboats were wrecked, and in 1865 he and his companion, Dr. Linck, were killed by a Sheik

Hamadi, who had done his best all along to prevent the expedition.

Decker, Sir Matthew (1679–1749), a political economist who, born at Amsterdam, came to London in 1702, and prospering as a merchant, obtained a baronetcy and a seat in Parliament. He wrote two treatises—one, in 1743, a consideration of the value of land and of the heavy loads borne by the English nation, especially the commercial part of it, and the other, in 1744, upon British foreign trade. Later economists have questioned the authorship as showing views too advanced for the times. Among his proposals were the abolition of monopolies, the forbidding the exportation of corn, the forbidding of begging, and a scheme for paying off the national debt.

Decks are the planked floors of a ship. In first-rate ships of the line in the days of wooden vessels there were three gun-decks running from stem to stern, these being known as upper or main, middle, and lower. Higher than the upper deck were the forecastle at the forward end, and the quarterdeck abaft the gangway. On these partial decks guns were also carried. The middle portion of the upper deck remained uncovered and was called the waist. Underneath the lower deck was the orlop deck, half below the water-line. The "half deck" is properly the space between the foremost bulkhead of the wardroom or cabin and the "break" of the quarter-deck. As the after-part of the quarterdeck became in course of the development of naval architecture raised above the rest, it obtained the name of "poop."

Declaration, a formal statement or affirmation. 1. In all actions it was the term used for the next step by plaintiff after service of the writ of summons. "A Statement of Claim" is now substituted by the Judicature Acts.

2. *A Declaration of use or trust* is a statement or admission that property is to be held to the use of or in trust for a certain party. If the property be land or chattels real, this must be in writing. A Declaration of trust is the usual mode of creating a trust, where the trust property is already vested in a trustee.

3. A Declaration was substituted for an oath in certain cases by the Statutory Declaration Act, 1835. A statutory declaration may be made before a Justice of the Peace or Commissioners or other officers authorised to administer oaths. Any person wilfully making a false declaration is guilty of a misdemeanor.

4. *Declaration of title.* The Act for obtaining this was passed in the year 1862, and after reciting that it is expedient to enable persons having interest in land to obtain a judicial declaration of their title to the same so as to enable them to make an indefeasible title to persons claiming under them as purchasers for a valuable consideration, it is enacted that every person claiming to be entitled to or to have a power of disposing of, for his own benefit, land (not of copyhold or customary tenure) for an estate of fee simple in possession absolutely or subject to incumbrances, estates, etc., or entitled to apply for the registration of an indefeasible title under the "Transfer of Land Act," may petition the Court of Chancery, now the Chancery Division of the High Court of Justice, for a Declaration of Title (Judicature Act, 1873).

5. *A Declaration of inability to pay debts.* Such a Declaration when signed and regularly filed constitutes an act of bankruptcy, upon which the debtor may be adjudicated a bankrupt. Under the old law it was termed a Declaration of insolvency. [Bankruptcy.]

6. Declaration is the term used in Scotland for a statement made by a prisoner before the magistrate immediately on his being brought before him. The magistrate has the power to postpone this for a period of not more than 48 hours after the arrest to give prisoner time to take legal advice.

7. *A dying Declaration* of persons *in extremis*, both in England, Scotland, and the United States, verified by accredited witnesses, is, under certain circumstances and under certain restrictions, admitted as evidence. This is, however, an exception to the ordinary rule as to secondary or hearsay evidence.

Declension (Latin *declensio*, falling off), in grammar, the series of modifications of the fundamental meaning of any noun by case-endings expressive of relation. The Greek grammarians treated the nominative as expressing the pure meaning of the word, and the other cases as "fallings off," inasmuch as they express not only the pure meaning but certain relations as well.

Declinate, leaning to one side, a term applied especially to the stamens in the cacti and other flowers.

Declination (1) of a star, in *Astronomy*, is the arc on the star's meridian in the celestial sphere, intercepted between the star and the celestial equator. It is, therefore, the altitude of the star measured from the equator. With this and the right ascension the relative position of the star in the heavens is determined. (2) In *Magnetism.* When a magnetic needle is suspended by a fibre or pivot at its centre it assumes a definite direction by reason of the earth's magnetic force. It lies in a line that is called the magnetic meridian at that spot on the earth's surface, and the more northerly end points to what is called the magnetic north. As a rule the magnetic north at any place will not coincide with the true or geographical north—the magnetic meridian will not be identical with the geographical meridian. The angle between these two directions is called the *declination.* Thus in London the declination is about 17° west of north; it increases up to a certain limit as one travels westwards, subsequently diminishing to zero in the region of Hudson's Bay. Beyond this the declination is east of north. There are slight daily variations, as well as steady long-period changes, in the declination at any place. Lines drawn on the earth's surface to mark those points where the declination is of the same value, are called *isogonic* lines. Lines of no declination, where the magnetic and geographic meridians coincide, are called *agonic* lines. Along these the needle points to the true north; one of

them traverses Hudson's Bay, the United States, and Brazil; a second crosses Spitzbergen, Russia, Asia Minor, the Indian Ocean, and Western Australia; and a third encloses an oval patch in Eastern Asia. Within this oval the declination is westerly; between it and the other two agonic lines the declination is easterly, and is to the west again over the remaining portions of the globe. Accurate declination charts, or variation charts as they are termed by sailors, are of great importance to navigation.

Declinometer, an instrument to measure magnetic declination. It consists essentially of a telescope capable of rotation in a vertical plane about a horizontal spindle carefully levelled, and a horizontal magnetic needle. The telescope is adjusted in the geographical meridian by reference to a star either in the meridian or at a known angle to it. Then the angle between the vertical planes of the telescope and of the needle is observed on a graduated arc round the instrument. This angle is the required declination.

Decoction, a term applied to certain pharmacopœial preparations made by boiling vegetable substances in water, straining and adding water; *e.g. Decoctum Aloes, Decoctum Sarsæ compositum.*

Decomposition. 1. In *Chemistry*, the splitting up of a compound into simple components by physical agents. In a wider sense the term is extended to interactions between two or more substances in which some of the resulting products are simpler than the reacting bodies, and so includes the greater number of chemical reactions. Decompositions may be divided into two classes—(1) *Endothermic*, in which, energy being absorbed, the continuous application of heat is necessary; (2) *Exothermic*, in which heat is evolved, and which, once started, do not require its application for their maintenance. These latter may be accompanied by explosion, which is never a feature of the endothermic decompositions. 2. In *Mathematics*, signifies the splitting up into components. Such a process is applicable to all such quantities as admit of addition in any general sense. Thus we may have a system of forces acting in various lines; these usually have a definite resultant, which we may regard as the quantity obtained by adding together the various constituents of the system. Then conversely we may say that this resultant may be decomposed into those several constituents. Such decomposition is exemplified in the article FORCE-POLYGON.

Decoy. [WILD FOWL.]

Decree, the judgment of a Court of Equity (the principal one now being the Chancery Division of the High Court of Justice) analogous to the judgment of a court of common law. A decree as distinguished from an order is final, and is made at the hearing of the cause, whereas an order is interlocutory, and is made on motion or petition. Whenever an order may in a certain event, resulting from the direction contained in the order, lead to the termination of the suit in like manner as a decree made at the hearing, it is termed a decretal order. *Decree nisi*, an order made by the Divorce Court on satisfactory proof being given in support of a petition for dissolution of marriage. It remains imperfect for at least six months (which period the court may shorten to three), and then unless sufficient cause be shown, it is made absolute on motion, and the dissolution takes effect subject to appeal.

Decrepitation, the crackling sound which frequently accompanies the heating of crystalline bodies. It is caused by the rupture of small crystals, owing to the conversion into steam of small quantities of water held within them.

Deduction, in *Logic*, the derivation of a proposition from some more general proposition. [SYLLOGISM.] Induction leads to new truths, deduction to the application of truths already obtained to new cases. Those who maintain that all our knowledge is derived from experience hold that correct deduction is virtually the application of our past knowledge to a case that turns out to confirm it—in other words, deduction and induction are but varieties of the same process.

Dee. 1. A river of Wales and England rising in Bala Lake, in Merionethshire, and flowing N.E. and N. through the Vale of Llangollen, past Chester, which it nearly surrounds, and thence by an artificial tidal canal which is now silting up, and by an estuary into the Irish Sea. The estuary, which is 13 miles long and from 3 to 6 miles wide, is at low water a broad stretch of shining sands, with the river winding through, but at high water it has an imposing appearance. The rapid rise of the tide over the sands has been commemorated by Kingsley. Its ancient sacred character has been alluded to by Milton and Spenser. The river is crossed by an aqueduct of the Ellesmere Canal and by a viaduct of the Chester and Shrewsbury Railway, and at Connah's Quay there is a railway swing bridge. Canals connect the river with the central water system of England. 2. A river in Scotland rising in the Cairngorm Mountains, and flowing with a rapid fall through Aberdeenshire and Kincardineshire to Aberdeen, where its stream has been diverted to form a harbour and docks. At the Linn of Dee the river flows through a chasm which is at one part only 4 feet wide. It passes Braemar, Balmoral, and Ballater, and has been a noted salmon river.

Dee, DR. JOHN (1527–1608), alchemist and astrologer, born in London and educated at Chelmsford and St. John's College, Cambridge, and becoming Fellow of Trinity. He studied mechanics and astrology, and between 1548-89 travelled a good deal abroad, especially in Germany and Hungary. He received ecclesiastical preferment from Edward VI., but in 1555 was charged with compassing Queen Mary's death by magic. He was, however, acquitted, and Queen Elizabeth had a great regard for him, and made him her astrologer, besides visiting him. He appears to have been duped by his assistant into an idea that he had found the elixir of life and had intercourse with spirits, and he searched

for the philosopher's stone. He died in poverty at Mortlake, and was buried there. Most of his works are still in MSS. at the British Museum and at Oxford and Cambridge. Besides his astrological works, he wrote on logic, geography, and navigation, and made some steps towards reforming the calendar.

Deed is an instrument in writing or print upon paper or parchment duly sealed and delivered. The name for a deed in the law French of Littleton and others is *fact*, *i.e. factum*, a thing done, of which deed is the translation. Deeds are of two kinds, *indented* and *poll*—a deed indented is termed an *indenture*, and has (or should have) a waving line cut teeth fashion on one of the edges of the material upon which it is written, usually the top edge, and when the deed consists of more sheets than one on the first sheet only. This formality is, however, often lost sight of, and is of little importance. Objection was once made to a deed indented—that it was *not indented* (*i.e.* not an indenture). The learned judge before whom such objection was made simply asked for a pair of scissors and himself healed the difficulty. The term indenture also implies that the deed is of two parts, *i.e.* two parts or copies exactly alike, and the two parts were divided by a line so as to afford additional means of anthentication; but except in the cases of leases, marriage settlements, partnership deeds, and some few others, there are seldom more parts than one. The cost of deeds is so heavy, that frequently where two or more parties are equally interested in a deed, it is deposited with some person for their joint use.

A *deed poll* is cut even or polled at the edges, and is usually of one part only, that is, the deed of one party or several parties of the same part. The form commences as in a declaration, "Know all men by these presents." The operative words of an indenture are "This indenture made between (parties) witnesseth." A deed to be *in all respects* absolute and irrevocable must be founded on a valuable or good consideration. [Consideration.]

A deed should be read over and explained to the parties before execution, which consists of signing, sealing, and delivery of it. Signing is not absolutely essential to the validity of a deed, though it is required as to less formal instruments by the statute of frauds; but sealing is absolutely essential, this being the most ancient mode of authentication and in use from the earliest times. At the present day the seal is no real security against fraud, for any impression upon wax or other substance employed is sufficient. The last requisite to the due execution of a deed is delivery, except in the case of a corporation, where sealing with the common seal has that effect. The usual form of delivery of a deed is for the executing party to say, with his finger upon the seal, "I deliver this as my act and deed." The delivery means that the person whose act and deed the instrument is, and who is bound by it, delivers it to the person who is taking some benefit thereunder. All the parties whose deed the instrument is must deliver it as their deed.

A deed may also be delivered as an escrow, *i.e.* to a third person to keep till something is done by the grantee; when the condition is performed the deed becomes effectual. A deed takes effect from the delivery and not from the date. Enrolment and registration are necessary in some cases by statute, and the Revenue laws have imposed certain stamps upon deeds the absence of which renders them inadmissible in evidence.

After execution a deed may become void by erasure, interlineation, or other alteration in any material part, but, generally speaking, such alteration will be presumed to have been made before the execution; at any rate if nothing appears to the contrary. A grantee may also disclaim the grant or disagree thereto, and a deed may be destroyed or cancelled, but such destruction or cancellation will not revest the thing granted in the grantor, though all obligations established by the deed between the parties will be at an end. If the deed has transferred property, the property continues transferred, just as if the deed existed; but if the seal be destroyed, the covenants which are to be performed are destroyed, because when any legal proceeding is taken upon the deed, it must be pleaded as a deed, and it is not the deed of the party whose deed it professes to be if that mark is destroyed which is the legal evidence of its being his deed. But as long as the seal is on the deed, and it exists entire, so long is the party whose deed it is bound by the covenant.

Acknowledgment of a deed is required in certain cases by a married woman; such acknowledgment must be taken before a judge or commissioner (formerly two were required), specially appointed for the purpose of her examination as to its contents apart from her husband, and she must declare it is executed of her own free will. The necessity, however, for this is now much curtailed by virtue of the Married Women's Property Act, 1882.

Deemster (A.S. *dóm*, doom, judgment; compare Engl. *deem*), the two judges of the Isle of Man, possibly the successors of the ancient Keltic priesthood, and at any rate of high antiquity. Till the fifteenth century (like other early judges) they acted according to unwritten laws of which they were the sole depositaries. They now act as legal members of the Council of the Lieutenant-Governor, and have concurrent jurisdiction over the whole island, both civil and criminal. Each has a salary of £1,000 a year.

Deer, the popular name for the members of the family Cervidæ, distinguished from all other Ruminants (q.v.) by the fact that the young are spotted, and by the character of the horns [Antlers], which are not borne by females, except in the genus Tarandus, and are wholly wanting in both sexes in the Musk-deer and Water-deer. These animals are almost universally distributed, but are entirely absent from Africa south of the Sahara [Barbary Deer], and from Australia. The lacrymal sinus or tear-pit beneath each eye secretes a waxy substance with a strong odour, probably serving as a means of recognition. It is to this secretion that Shakespeare refers (*As You*

Love It, II. i.) when he describes the wounded deer—

> "On the extremest verge of the swift brook
> Augmenting it with tears."

Both sexes usually possess canine teeth in the upper jaw, and in some species they are so largely developed in the males as to form effective weapons of attack and defence. The species differ widely in habitat, but generally agree in living in pairs or in small herds under the leadership of an old male, and in feeding on herbage and the tender shoots of trees and shrubs. They vary greatly in size, the elk standing from seven to eight feet high at the shoulder, while the muntjac scarcely reaches a quarter as much. The flesh is eaten, and the venison of some species is excellent; the skin is tanned for clothing and rugs, the antlers are utilised for knife-handles, etc. The family contains about 50 living species, arranged in the following genera: Alces, Tarandus, Cervus, often divided into subgenera, with about 40 species, one of which, the Red-deer (q.v.), is British; Capreolus, Dama, Cervulus, Moschus (sometimes regarded as an aberrant bovine) and Hydropotes, the chief species of which are described under their popular names.

Deer Forests, tracts of wild mountain and moorland for the preservation of the red-deer. Their extent in Scotland is estimated at a tenth of the whole area, and they stretch virtually right across it. Much feeling has been aroused by the alleged clearances of crofters to make room for deer, and by the fact that the forests are often rented by wealthy strangers, who substitute for the skilful and admirable sport of deerstalking the mere butchery of the deer-drive. The island of Rum is the most recent case of clearance. Deer forests should not be confused with the deer parks of England, where the deer are hardly to be regarded as *feræ naturæ*.

Deer Mouse (*Hesperomys leucopus*), a mouse running into several races or varieties, distributed over the greater part of North America. It is about three inches long, frequently fawn colour, with white feet (whence it is also called the White-footed Mouse), but individuals differ greatly in hue. [MOUSE.]

Default, omission or neglect to do an act which one ought to do. Where a defendant in an action omits to appear, or, having appeared, to put in an answer to the plaintiff's claim within the time or times limited for those purposes, or within such extended time as may have been granted him, it is presumed he has no defence and the plaintiff is therefore entitled to sign judgment against him.

Deffand, MARIE DE VICHY-CHAMROND, MARQUISE DU (1697—1780), a noted letter-writer and woman of society. Born of a noble family of Burgundy, she was sent to a convent in Paris, and there her sceptical views led to a visit from Massillon, who hoped to re-convert her, but vainly. She married young a man much older than herself, but the ill-assorted marriage was soon followed by a separation, and the young wife plunged into the vortex of the corrupt French Court of the time. A biographer styles her *une des filles de joie du lupanar du Palais Royal*. Tiring of this life, she returned to her husband, but after a few weeks left him for ever. In 1778 she had formed a friendship with Voltaire. She later had a *liaison* with Hénault, with whom she remained till his death. She then retired to a convent, where, however, she kept up her mundane acquaintances and habits. At the age of 68 she made the acquaintance of Horace Walpole, and seems to have loved him. Her correspondence was chiefly with Voltaire, the Duchess of Choiseul, and Walpole. She has been looked on as a sort of mirror of the life of the Regency period.

Definite Proportions, LAW OF, formulated by Dalton (q.v.), that substances combine chemically in certain fixed proportions only. [ATOMIC THEORY.]

Deflagration, any decomposition accompanied by noise or explosion. It is also applied to the process in which a substance is oxidised by heating it in the dry state with some other highly oxidised body, as nitre or potassium chlorate, etc.

Deflection, generally, means a change of direction. Thus, in navigation it means the change of course of a vessel; in optics, the change of course of rays of light. Many measuring instruments record their readings by deflection of a needle or pointer, the magnitude of the deflection being a measure of the cause of disurbance and also a measure of the sensitiveness of the instrument.

Defoe, DANIEL (1661–1731), of world-wide renown as the author of the immortal *Robinson Crusoe*. His father, who called himself simply FOE, was of Northamptonshire origin, and was a butcher at St. Giles's, Cripplegate. The son was originally intended for the ministry, but eventually became a horse-factor, was concerned in Monmouth's rebellion, and in 1688 was in William III.'s army. He then travelled in France and Spain, and was later secretary in a pantile factory at Tilbury. He made his literary *début* as a pamphleteer, and in 1701 he published a poem—*The Trueborn Englishman*—in which he apologised for William III.'s Dutch extraction. A satire in 1703—*The Shortest Way with Dissenters*—cost him a trial at the Old Bailey, a fine of 200 marks, three exposures in the pillory, and imprisonment. The mob cheered him as he stood in the pillory, and his *Hymn to the Pillory* made a great sensation. While in prison he started his *Review*, which lasted from 1704 to 1713, and was a monument of industry. Released in the summer of 1704, he was patronised and employed by Harley, who recommended him as a useful man to Godolphin, who sent him on a mission to the West of England and to Scotland. In 1709 he wrote a *History of the Union*, and on the return of Harley to power in 1710 did much service as a political writer. He seems to have had little political principle, and to have been a sort of "Vicar of Bray," editing Jacobite papers, with, however, the intention and effect of making them harmless to the Government. His inconsistency became more conspicuous after the Hanoverian

succession, and he speaks of himself as having "bowed in the house of Rimmon." In 1719 he issued the first two volumes of *Robinson Crusoe*, which he founded upon the story of Alexander Selkirk, transmuting, however, the leaden facts into pure and valuable gold. The same year saw the appearance of *Duncan Campbell*, *Memoirs of a Cavalier*, and *Captain Singleton*. In 1722 Defoe published *Moll Flanders*, *History of the Plague of London*, and *The History of Colonel Jack*. He wrote also many other works. In the latter part of his life he lived at Stoke Newington, and seems to have had some family troubles. He was buried at Bunhill Fields.

Deformities may be classified under the two heads, congenital malformations and acquired deformities. The latter result from injuries and from certain forms of disease (*e.g.* rickets) occurring after birth, and will be no further considered here. Congenital malformations are due to some disturbance in the natural development of the fœtus within the uterus. Imperfect closure of the cerebro-spinal cavity produces the conditions known as *hernia cerebri* and *spina bifida*. Defects in connection with the branchial arches may result in *cleft palate*, *hare-lip*, and *fissure of the neck*. The vitalline duct may persist, producing what is known as *Meckel's divertieulum*. Other deformities which may be mentioned are the various forms of club-foot and the rare condition known as transposition of viscera. When the deviation from the normal condition is very great, what is known as a "monster" results. Where two rudimental embryos are involved in the perversion of development, a "double monstrosity" is produced.

Degarû, a branch of the Mishmi nation, North Assam highlands, between the Midhi and Neju, with distinct speech; "unmistakable Mongolian features" (T. T. Cooper, *Mishmi Hills*); there are three divisions—Yo-en, Tarying, and Brama.

Degeneration, in *Pathology*, certain alterations of the tissues of which the body is composed, which have been described by the morbid anatomist and pathologist. Lardaceous, waxy, or amyloid degeneration occurs in cases of long-continued suppuration, and affects mainly the liver, kidneys, spleen, and intestines. On microscopic examination of the diseased parts a new deposit of colourless refractile "amyloid" material is found to be present for the most part in the walls of the small arteries. The exact composition of this amyloid matter is not known; it seems to be allied to the substances known as proteids. Fatty degeneration is a term of somewhat undefined significance. It is applied to mere overgrowth of fatty tissue, to the distension of cells with oil drops, as in fatty degeneration of the liver, and to the breaking up of the protoplasm of cells which is met with in such a condition as fatty degeneration of the heart. Calcareous degeneration is of particularly common occurrence in the internal coats of arteries. In extreme instances the artery may become converted into a perfectly rigid tube. It is a condition met with in advanced life, and may result in rupture of the vessel, or in gangrene, from failure of the artery to respond to the varying needs of the parts supplied by it with blood. Other forms of degeneration which may be mentioned are mucous and colloid degeneration, pigmentary degeneration, and uratic degeneration.

In *Biology*, the operation of the disuse of parts, through the laws of economy of nutrition and of acceleration of development, to produce a simpler structure. It is especially characteristic of organisms that lead a parasitic or otherwise sedentary life, in which case it will affect organs of locomotion, organs of special sense, which especially subserve the capture of food, and even the nutritive and food-elaborating organs themselves. Under other circumstances, increased facilities for growth, for longevity, or for asexual reproduction may lead to degeneration so far as sexual characters are concerned. It is a moot question whether the reduction of organs which undoubtedly results from their disuse, by the law of economy of nutrition, is directly inherited, it being an acquired character, or whether individuals arising by spontaneous variation with reduced organs merely survive as the most fit. When, however, a structure is aborted or suppressed, its abortion or suppression tends, according to the law of acceleration of development, to occur at a slightly earlier period in the life of each successive generation. Parasitism (q.v.), for instance, may at first be only occasional and partial; but among flowering plants, when habitual, it means obtaining elaborated food made up of organic substances and rendering the action of chlorophyll (q.v.) upon atmospheric carbon-dioxide unnecessary. The leaves and stems of many parasites accordingly contain little or no chlorophyll and are brown, the leaves also being commonly much reduced in size. The same changes occur in some plants which are saprophytes (q.v.), living among dead leaves or other decaying organic matter. Entozoa, or internal parasitic worms, illustrate several phases of extreme degeneration, being in some cases destitute even of a mouth. In the Ichthyophthira, crustaceans which become parasitic upon fish, the embryo has eyes and swimming organs which are lost in the adult, as is also the case with the barnacles, which are merely sedentary and not truly parasitic. One of the most striking cases of degeneration is that of the ascidians [TUNICATA], which possess a true vertebrate notochord in their larval stage and afterwards lose it, being in fact a side branch of the ancestral Vertebrata degenerating when adult to the grade of the lowest mollusks. Apogamy (q.v.), or the loss of the sexual process, accompanied by increased means of vegetative reproduction, as in the mushroom, is another case of degeneration, and the reversion of the bee-orchis to self-pollination, whilst belonging to a group all specially adapted for insect pollination (q.v.), may be regarded in the same light.

De Gerando, JOSEPH MARIE, BARON (1772–1842), a French writer and philanthropist, born at Lyons of a family of Italian origin. In 1797 he came to Paris, but soon afterwards went to Germany, where he enlisted in Massena's army. He here wrote a treatise which was crowned and

published in 1800 with the title *Des Signes et de l'Art de Penser*. In 1803 he published *Histoire de la Philosophie*, and in 1804 he became a member of the Academy. Napoleon made him secretary-general to the Ministry of the Interior. In 1820 appeared his *Visiteur des Pauvres*, and in 1824 a treatise *Du Perfectionnement Moral*. He was made a peer of France in 1837.

Degree is a measure of an angle. It is the 360th part of a complete rotation, and is therefore the 90th part of a right angle. It is subdivided into 60 minutes, and each minute into 60 seconds; in chartography and navigation, the $\frac{1}{360}$th part either of any circumference of the earth which passes through the poles, or of any circle drawn about the earth parallel with the equator. The circumference of the earth through the poles being constant, any $\frac{1}{360}$th part of that circumference is, of course, the same in length as any other. The degree of latitude, in consequence, does not vary in length, and measures a little less than 60 geographical miles, or admiralty knots of 6,080 feet each. The degree of longitude, on the other hand, varies in length at every latitude north or south. At 0° latitude, *i.e.* at the equator, a degree measures exactly 60 nautical or geographical miles, that is, 69·173 statute miles. At intervals of 10 degrees of latitude the length of a degree of longitude, in miles, is as follows:—

Latitude.	*Miles.*	*Latitude.*	*Miles.*
0°	69·07	50°	44·35
10°	67·95	60°	34·50
20°	64·84	70°	23·60
30	59·75	80°	11·98
40°	52·85	90°	0·00

Degree, University, a title conferred on persons who have shown proficiency in arts, law, theology, science, or divinity. In the school of law at Bologna early in the 12th century the teachers of civil law formed themselves into a corporation of "doctores" (teachers) and admitted to it thenceforward those of their pupils who had proved their fitness by examination. In 1151 Pope Eugenius III. arranged that the title of "doctor" should be conferred on those proficient in canon law; and degrees in theology were first instituted at the University of Paris by Peter Lombard. Gradually degrees were also instituted in arts and medicine. "Bachelor," the first degree, usually meant only that the holder had studied his subject a certain time; "licentiate," that he had passed a private examination; "doctor," that he had held a public disputation and was qualified to teach; "master," which replaced "doctor" in the Faculty of Arts, also implied licence to teach, and was given after seven years' study (the period of apprenticeship). The degree of "Doctor of Philosophy" is modern and of German origin. German students, however, do not usually proceed to any degree, though that of "licentiate" in law and medicine still survives in some German universities. Some of these, and some American colleges, have been extremely lax as to granting degrees "in absence" for a fee, and (sometimes) on receipt of a Latin essay, which could easily be written by deputy. Thus, an Englishman in the last century obtained the degree of Doctor of Divinity (in absence) for a certain "Anglicus Ponto," who turned out to be his dog. Professor Mommsen's exertions some years ago stopped this practice in Germany, and it has also been checked in the United States. Besides the old degrees, there are the modern Bachelor and Doctor of Science, Doctor of Letters, and many strange American novelties, *e.g.* "Bachelor of Architecture" and (at Ladies' colleges) "Mistress of Music." "Lambeth Degrees" are conferred by the Archbishop of Canterbury in accordance with an Act of Henry VIII. transferring the power of doing so to him from the Pope. M.A. is the most usual; of late years it has only been conferred after examination. Honorary degrees—usually in law for laymen and divinity for clergymen—are conferred on distinguished strangers by many universities.

Dehgan, a numerous people of the Kunar valley and parts of Laghmân, north-east Afghânistân, who are the Laghmâni mentioned in Sultan Baber's History; they differ considerably from the surrounding Afghân tribes, especially in their language, which is substantially neo-Sanscritic modified by contact with Persian and Pukhtu, and also containing an unknown element; there are six divisions—Dunieh, Chaguni, Kuli, Buzurg, Deba, and Malik. The Dehgans are comparatively recent converts to the Mohammedan religion, and still retain many pagan rites or practices (MacGregor).

Dehiscence, or splitting, a term applied, in botany, especially to the bursting of the anther or of the fruit. The anther generally dehisces *longitudinally;* but, when short, sometimes *transversely;* in the heath-tribe, more especially, by a terminal *pore;* and, in the barberry and the bay, by the formation of flap-like *valves* or *opercula*. Dehiscence, which accompanies the ripeness of the pollen, results from the absence of thickening bands in certain cells of the *endotheeium*, or inner membrane of the wall of the anther. Among fruits, dehiscence is mainly confined to dry fruits containing more than one seed, the others being *indehiscent*. The succulent fruits of the horse-chestnut, balsam, walnut, and yellow water-lily are exceptional in being *dehiscent*. Fruits may dehisce by *pores*, as in the capsules of the poppy and snapdragon; *transversely*, as in the pimpernel (*Anagallis*) and plantain (*Plantago*); by teeth, as in *Primula* and the pinks; or *longitudinally*. The legume splits longitudinally down both sutures; the follicle, as in the larkspur, down the ventral suture only. Where the fruit is syncarpous, dry, and many-seeded, it splits into valves, which may each be a carpel or halves of two contiguous carpels. [Capsule.]

Dehwar (Diwar, Dihkan), the collective name of the Persian-speaking communities scattered over eastern Irania (Afghânistân and Balûchistân); are numerous, especially in the Sarawân uplands, and in the Herat, Kabul, and Kalat districts. Many are now occupied with trade; but all were originally agricultural settlers, whence their name, which means "villagers" or "husbandmen," from *deh*,

village. These Tajiks (Persians) "are Iranians, a remnant of the old Persian population subdued by the Afghâns, but still speaking Persian and retaining the Persian type of features" (F. V. Stein, in *Petermann*, March, 1879). Those of Balûchistân are classed by Robertson (1841) in five main divisions—Sewa, Ali, Moghal, Tolonti, and Dodakhân. The total population probably exceeds one million.

Deianeira, daughter of Æneus, king of Caledon, was very beautiful, and had many suitors. She promised to bestow her hand only upon the strongest, and this was Hercules, whose wife she became. Nessus the Centaur, while bearing her over a river, offered her violence, and Hercules shot him with a poisoned arrow. Before dying he gave his shirt stained with poisoned blood to Deianeira as a sure means of reclaiming the love of her husband, should it ever wander. When the occasion arose she gave the shirt to her husband, who put it on. The poison ate into his flesh, and in agony he burnt himself upon Mount Ætna. Deianeira killed herself from grief and remorse.

Dei Gratia (Latin *by the grace of God*), a qualification of their title originally used by bishops and ecclesiastical dignitaries, probably first in the 4th century, afterwards adopted by secular potentates. Ethelbert adopted the title "Dei Gratia Rex Anglorum" in 605 A.D. Charles the Great described himself as "Dei Gratia Rex Regnique Francorum Rector." The first florins coined in England were without the letters "D. G.," but owing to the indignation expressed by the religious world the coinage of them was stopped.

Deinosauria. [DINOSAURIA.]

Deinotherium. [DINOTHERIUM.]

Deira, an ancient Saxon division of Anglia, from the Tees to the Humber, and to the West as far as Cumbria. Bernicia, to the north, was afterwards joined with it to form the kingdom of Northumbria, but they were again separated into earldoms. The name gave Pope Gregory the occasion of making his celebrated puns about the Saxon slaves at Rome, who from *Angli* were to become *Angeli*, and be plucked *de irâ Dei*.

Deist (Latin *Deus*, God), a term now usually applied to those who believe in a God, but deny miracle or supernatural relation [THEISM], and especially to a series of English writers beginning with Lord Herbert of Cherbury (died 1648), and comprising the second Lord Shaftesbury, Antony Collins, Matthew Tindal, Mandeville, Toland, Chubb, and Thomas Paine (died 1809). Their opinions and treatment of religious subjects varied greatly. Lord Herbert of Cherbury believed that the idea of God and moral principles were innate; Lord Shaftesbury, in polished language, exalted natural religion and its professors at the expense of Christianity; Toland and Collins treated the Scriptures as forgeries; Tindal argued that they were genuine in substance, but mere documents of natural religion; Mandeville held that morality was simply based on self interest, and argued that "private vices were public benefits." Doubtless the movement owed much to the philosophy of Locke. Though a decided believer in Christianity himself, his empiricism and his strenuous insistence on the claims of reason were pushed farther than he intended by the Deists. But the tendency of the age was strongly opposed to "enthusiasm" and mysticism in religion, and Deism is an extreme expression of this opposition. Much can be learned about it from the *Alciphron* of Berkeley (who, however, was strongly biassed against it); while, amongst others, Leland, the German historian Lechler, and Leslie Stephen (*English Thought in the Eighteenth Century*) have dealt with the movement historically. (See also articles on the above-named writers.)

Déjazet, PAULINE VIRGINIE (1797–1875), a French actress born in Paris. She went on the stage at the age of five, and played for some time the parts of children, boys, and soubrettes at Lyons. In 1821 she entered at the Gymnase, where she played till 1834, when she migrated to the Palais Royal. From 1844 to 1849 she played at the Variétés. She played in Paris, in the provinces, and in London. In 1859 she took the management of the Folies Dramatiques, and in 1868 retired upon a pension of £80. For her vivacity, spontaneousness, and perpetual youth she has been called the "actress of young people," and compared to Anacreon's cicada.

Dekker, THOMAS (1570–1637), a prolific English dramatist, much of whose writing, however, was done in collaboration. In 1600 appeared his *Shoemaker's Holiday* and the *Pleasant Comedy of Old Fortunatus*. In 1602, in return for Ben Jonson's hostility, which had taken the place of former friendship, he satirised the poet in *Satiromastix*. In 1603 appeared *The Wonderful Year*, which commemorated the Plague, and the *Bachelor's Banquet*. In 1604 he wrote, with Middleton, the *Honest Whore*, and in 1607, with Webster, *Westward Ho! Northward Ho!* and a fragmentary play, the *History of Sir Thomas Wyat*. In 1608 he wrote a pamphlet, the *Bellman of London*, and another called *Lanthorn and Candlelight;* in 1609 the *Gull's Hornbook;* in 1611, with Middleton, the *Roaring Girl;* and he joined with Massinger in writing the *Virgin Martyr*. In 1624, with Ford, he produced the *Sun's Darling*, and later, with Ford and Rowley, the *Witch of Edmonton*. After 1637 he disappears from the scene. As he had already been more than once imprisoned for debt, this may have also been his ultimate fate.

De La Beche, SIR HENRY THOMAS (1796–1855), an English geologist. He was educated at Great Marlow, and joined the army in 1814. In 1817 he became a Fellow of the Geological Society, of which he was afterwards secretary and (1847) president. In 1820 he wrote a paper upon the depth and temperature of the Lake of Geneva, and in 1824 he wrote upon the geology of Jamaica. In 1831 appeared his *Manual of Geology*, in 1834 *Researches in Geology*, and in 1853 his *Geological Observer*. He was appointed chief of the Government Geological Survey, and in 1848 he was

knighted. He also received honours from the Danish and Belgian Governments, and was a corresponding member of the Paris Academy of Sciences. His geological collection in Craig's Court was the nucleus of the present Jermyn Street Geological Museum and School of Mines.

Delacroix, Ferdinand Victor Eugène (1799–1863), a French painter of the romantic school, born at Charenton St. Maurice, near Paris. He entered the studio of Pierre Guérin, a follower of David, and here he had Géricault as a fellow pupil, whose influence showed itself in Delacroix's work. In 1822 appeared his *Dante and Virgil*, which was commended by M. Thiers, and in 1824 his *Massacre of Scio*. In 1831 his *Liberty directing the People at the Barricades* attracted much notice. In 1832 he went to Morocco, and the study of light there and of costumes had a great effect upon his subsequent work. He did much lithographic drawing, and his illustrations of Faust were highly approved by Goethe.

Delagoa Bay, a Portuguese possession on the S.E. coast of Africa. In 1875 a difficulty between England, Portugal, and the Transvaal as to the bay was submitted to the arbitration of the President of the French Republic. The chief point was as to the possession of Inyak Island and the Maputa river, and the southern part, including the Maputa river up to the Lobombo Mountains, was declared Portuguese territory. The bay, stretching from lat. 25° 30′ to 26° 20′ S., has a width of 25 miles, and, though having many islands and shoals, is of easy navigation, and affords good anchorage. The principal rivers falling into it are the Maputa and the Komati, and the Maputa with its tributary the Tembe is navigable in its lower course. A railway was opened in 1890 to the frontier of the Transvaal, and will, owing to the presence of the gold-fields, become more and more important. In 1889 this railway was the occasion of a serious difficulty between Portugal, England and the United States, which was referred eventually to arbitration. Drainage works and a sea-wall have done much to render healthy the swampy and malarious Portuguese settlement of Lourenço Marques.

Delambre, Jean Baptiste Joseph (1749–1822), a French astronomer, born at Amiens, and educated at the college there, where the Abbé Delille made him a good scholar. He then turned his attention to astronomy, and studied under Lalande, who used to say that Delambre was his best work. In 1790 his *Tables of Uranus* gained the prize of the Academy, and his *Tables of the Satellites of Jupiter and Saturn*, published in 1791, caused his unanimous election to the Academy the next year. He was selected with another to measure the arc of the meridian between Dunkirk and Barcelona, a work which the war delayed, and which was not finished till 1799. He 1802 he was made chevalier of the Legion of Honour, becoming an officer in 1821. In 1803 he was appointed secretary to the Institut (now the Academy of Sciences), and in 1807 he succeeded Lalande as professor of astronomy at the College of France. Among many other works, he published five volumes of a *History of Astronomy*.

Delane, John Thadeus (1817–1879), the son of a barrister, was born in London, and educated at King's College, London, and at Magdalen Hall, Oxford, where he graduated in 1839. He then studied at the hospitals, went to the bar, and finally took to reporting in the House of Commons. The attention of the proprietor of the *Times* was drawn to him, and he was appointed on the *Times* staff, becoming editor in 1841. This post he filled till 1877, being aided for much of the time by his brother-in-law, Dr. Dasent (q.v.). He did not write articles, but the *Times* owed much of its influence to his strong personality.

Delaroche, Hippolyte Paul (1797–1856), a French painter of the Eclectic school, born at Paris. He studied under Baron Gros, and in 1824 his picture of *St. Vincent de Paul Preaching before Louis XIII.* brought him into notice, as did his *Joan of Arc before Cardinal Beaufort*. He then turned his attention especially to historical subjects, and between 1826 and 1837 he produced the *Death of President Durante*, *Death of Queen Elizabeth*, *Princes in the Tower*, *Cromwell and Charles I.*, *Execution of Lady Jane Grey*, *Charles I. and Parliamentary Soldiers*, and *Strafford receiving Laud's Blessing on his Way to Execution*. From 1837 to 1841 he was occupied in adorning the École des Beaux-Arts, and in the composition he introduced seventy-four figures. His *Floating Martyr* has been much admired. Besides many other works, he also painted several portraits. Although not displaying great creative powers, he was picturesque in style and precise and accurate in details.

De la Rue, Warren, an English electrician, born in 1815 in Guernsey, was educated in Paris, and became a member of the noted paper manufacturing firm. He had much to do with the Exhibitions of 1851 and 1862, and took part in the International Electric Congress at Paris in 1861. He has been president of the Royal Astronomical Society, of the Chemical Society, and of the London Institution, and in 1878 he became secretary of the Royal Institution. In 1880 he was made corresponding member of the French Academy of Sciences. He has done good work in electricity and in astronomical photography.

Delaware, one of the United States of America, forming part of a peninsula, and having the Susquehanna and Chesapeake Bay on the W., Delaware river, bay, and the ocean on the E., Pennsylvania on the N., and Maryland on the S. and W. It is 1,960 square miles in extent, thus being the second smallest of the States. The state is hilly in the N., the hills being formed of granite, gneiss, and limestone. South of this is a strip of red clay, followed by greensand and sand, and the southern part consists of swamp and sand. On the coast are salt marshes, succeeded by fertile alluvium. In the west, wood is abundant. The state keeps the old-country names of Kent, Sussex, and Newcastle for its three counties, and is also divided into hundreds. The rivers are small but navigable,

and a canal connects Chesapeake and Delaware bays. Among the productions are kaolin and iron ore; but the chief industries are agriculture, market-garden produce, and fruit, especially peaches, and fishing, particularly of oysters and crabs. Of the population of 147,000, about one-sixth are negroes; and Delaware was formerly a slave state, though it did not take part in the Secession. The capital is Dover; but the largest town is Wilmington. The district was formerly settled by Swedes and Finns, but became Dutch in 1655, passing to the English in 1664.

Delaware Indians, a large division of the Algonquian race [ALGONQUINS], of which they regard themselves as the elder branch or original stock, whence their national name *Lenni Lenâpé*, "Genuine" or "Trueborn Men." Their original domain comprised Delaware, with parts of New Jersey, Pennsylvania, Maryland, and Virginia, where they formed the league of the "Five Delaware Nations," which also comprised the now extinct Mohicans. But this league was broken up at an early date by the more powerful Iroquois Confederacy [IROQUOIS], and in the seventeenth century the Delawares proper were confined to the banks of the Delaware and Schuylkill rivers. It was here that William Penn concluded his famous treaty with them in the year 1682 beneath the shade of the Shackamaxon elm, where he founded the city of Philadelphia. But this treaty of "Brotherly Love" did not save them from the irresistible advance of the white settlers; and at present the Delaware nation is confined partly to a Reserve (Kiowa and Wichita Agency) in Indian Territory, and partly to the Six Nations' Reservation of Ontario, Canada. The latter now usually speak Minsi; but the original Delaware, a typical Algonquian language, was first reduced to writing by the Moravian Brethren, who began to evangelise these Indians about the year 1740. David Zeisberger's Grammar was published in the *Transactions of the American Philosophical Society* in 1827, and his Dictionary was issued at Cambridge, Massachusetts, in 1887. A fuller dictionary from an anonymous MS. was edited by Dr. D. G. Brinton for the Pennsylvania Historical Society, Philadelphia, 1888. *The Lenâpé and their Legends*, by the same author, appeared at Philadelphia in 1885.

Delescluze, LOUIS CHARLES (1809–1871), a French Communist, born at Dreux. He studied law at Paris about 1830, and, becoming a journalist, adopted advanced political views and took part in revolutionary movements. He was imprisoned and fined and sentenced to banishment for revolutionary articles. He escaped to England, but, returning to France in 1853, he was imprisoned and banished to Cayenne. He returned to France in 1869, and became a prominent member of the Commune in 1871, when he was shot at a barricade. Besides his fugitive writings, he wrote *De Paris à Cayenne, Journal d'un Transporté*.

Delfshaven, a town of South Holland, on the Maas, $1\frac{1}{2}$ miles W. of Rotterdam. There is some shipping.

Delft, a town of South Holland, on the Schie, 8 miles N.W. of Rotterdam. It is intersected by canals, and among its notable buildings are the seventeenth-century town-house; a fifteenth-century church, which has monuments to William I. of Orange, who was assassinated at Delft, and to Grotius, and contains the vaults of the royal family; and a church in which Admiral Van Tromp and the naturalist Leeuwenhoek are buried. There are also an arsenal and East Indian College and a Polytechnic. The old manufacture of pottery, for which Delft was famous, has passed away; but there is a manufacture of carpets, casks, and baskets.

Delhi, or DILLI, a division, a district, and its capital in the Punjaub, British India. The division covers an area of 5,609 square miles, lying between the Ganges E. and the deserts of Mooltan W., being bounded S. by Rajpootana and N. by the outlying spurs of the Himalayas. It includes the districts of Delhi, Gurgaon, and Karnal. The district comprises 1,227 square miles. The soil is sandy and the climate warm and dry. Cultivation is dependent on irrigation, which is supplied from the Jumna and its tributaries with several large artificial canals. The bulk of the population is Mohammedan. The city, situated on the right bank of the Jumna, and known in early times as Indraprestha or Inderput, became, after the conquest of North-Western India, the capital of the Mogul Empire, and was then called Shahjehanabad, from the sovereign who enclosed it with a stone wall and adorned it in other ways. In the height of its prosperity its circumference is said to have been thirty miles, but at present this is reduced to eight miles. Many of the old palaces and gardens are mere ruins, but the palace of the Great Mogul, the Jumna Musjid, the Souna Musjid, the tombs of Humaon and Nizam-ud-Deen, and the fort of Salimgarh, are noble specimens of Mussulman architecture. Several of the streets are broad, straight, and finely laid out. The Delhi College, founded in 1792, is an important educational centre. The British under Lake took possession of the city in 1803, and it has remained in their hands ever since, with the exception of a brief period of four months during the Indian Mutiny (1857), when it was recaptured from the rebels by Sir R. Archdale Wilson. The chief local manufactures are gold filigree work, shawls, and embroideries, but being a depôt for the trade between Calcutta, Bombay, and Rajpootana, Delhi is one of the most important markets in British India.

Delilah, or DALILAH, a woman who lived in the valley of Sorek in the territory of Dan and near the Philistine frontier. Samson, the Israelite champion, in one of his frequent fits of amorous weakness, became attached to her, and she, under the influence of Philistine bribery, beguiled him into revealing that the source of his strength lay in his hair (Judges xvi.). Having shorn him of his locks she then betrayed him to his enemies. [SAMSON.] Delilah thus became a type of feminine treachery, but Milton in his *Samson Agonistes* puts

into her mouth excuses that support a more lenient view of her conduct.

Delille, JACQUES, the illegitimate son of a French lawyer, was born at Aigueperse in 1738. He early acquired a reputation for scholarship, and became professor at Beauvais, Amiens, and finally at the Collège de la Marche in Paris. In 1769 he published a verse translation of the *Georgics* which won him the chair of Latin Poetry at the College of France as well as admission to the Academy. *Les Jardins* was his next work, and then, after travels in Greece and the Levant, he wrote *L'Imagination*. Ruined by the French Revolution he took refuge in Switzerland, Germany, and England, completing in London his translation of the *Paradise Lost*. In 1802 he returned to Paris and was restored to his professorship. *La Conversation*, *La Pitié*, *The Æneid*, and other poems with many essays flowed from his pen before his death in 1813. He lacks the fervour of genius and displays little power of invention, but his versification is sweet and melodious, whilst his sentiments are always moral and sometimes pathetic.

Deliquescence. Certain substances which, when exposed to the air or to an atmosphere containing moisture, absorb water, become moist, and finally liquefy. Such substances are said to be *deliquescent*, and the phenomenon is known as *deliquescence*. Notable examples are calcium chloride, phosphorus pentoxide, and potassium carbonate.

Delirium (Latin *deliro*, to go out of the way: *de*, away; *lira*, a furrow). Hobbes defines delirium to be "too much appearing passion." Madness may be said to be habitual delirium, and delirium may be regarded as a temporary madness. The popular equivalent for the term delirium is light-headedness. Delirium is often associated with fever, and may then be due to disease of the brain (*e.g.* meningitis), or be symptomatic of one of the specific fevers (typhus, typhoid, smallpox, etc.). Or delirium may be unassociated with fever, as in poisoning by belladonna or alcohol, in certain forms of chronic disease, and in dying people. The treatment of delirium is largely dependent on its cause. The main indication is to procure sleep; the local application of cold to the head is often of considerable service.

Delirium Tremens. [ALCOHOLISM.]

Delitzsch, a town in Saxony, Germany, on the right bank of the river Lober, and fourteen miles N.W. of Leipsic, possesses factories of hosiery, woollen cloths, and tobacco, and is the seat of several large annual fairs.

Delitzsch, FRANZ, born at Leipsic in 1813, attained eminence as a theologian and student of Jewish antiquities. His *History of Jewish Poetry* appeared in 1836, and among the most successful of his later works may be mentioned *Biblical Psychology*, *Christian Apologetics*, *A Day in Capernaum*, and a valuable commentary on Isaiah.

Delius. [APOLLO, DELOS.]

Delius, CHRISTOPH TRANGOTT, born in Saxony about 1730, devoted his life to practical mineralogy, and wrote a treatise entitled *Directions for the Working of Mines*. He was appointed counsellor for the department of mines and director of the mint at Vienna, and died in 1779.

Della Cruscans, a set of writers of affected and insipid English verse, who resided at Florence towards the close of the last century, and borrowed their name from the Accademia Della Crusca, a learned society at Florence. They were savagely satirised by Gifford (q.v.) in the *Baviad* and *Mæviad*.

Delolme, JEAN LOUIS, was born at Geneva in 1740, and educated for the bar, but a political pamphlet caused his early expulsion from the Swiss Republic, and he wandered about Europe in great poverty. He settled down as a journalist in England, where he produced (1771) his well-known treatise on *The Constitution of England*, a performance highly creditable for a foreigner, and esteemed by weighty authorities at the time of its publication, but now almost forgotten. His minor works were unimportant. He returned to his native country shortly before his death in 1806.

Delorme, MARION, the daughter of a respectable bourgeois at Blois, was born about 1612, though some doubt exists on both these points. She grew up beautiful and clever, but her moral character left much to be desired, and whilst a mere girl she became the mistress of the poet Desbarreaux. She next transferred her affections to Cinq Mars, and among his successors were the Duke of Buckingham and perhaps Louis XIII. himself. Her drawing-room in Paris divided with that of Ninon de l'Enclos the reputation of being the rendezvous of all the wits, politicians, and intriguers of the day. She mixed herself up in the affairs of the Fronde, and after the arrest of Condé would probably have been consigned to prison had not sudden death cut short her career in 1650. The story that her decease was a mere pretence, that she lived for many years in England, returned to Paris, married Lebrun, and expired poverty-stricken and obscure in 1806, cannot be regarded as trustworthy. Her strange adventures supplied Victor Hugo with a plot for one of his most famous dramas.

Delorme, PHILIBERT, born at Lyons about 1518, studied architecture in Rome and became thoroughly imbued with the principles of classical art. His first patron was Cardinal Du Bellay, through whom he obtained the favour of Catherine de Medici and Henry II. He built the crescent at Fontainebleau, the châteaux of Anet and Meudon, and began the palace of the Tuileries. Primaticcio assisted him in many of his designs. His writings as well as his buildings contributed much to the development of the French Renaissance. He died in 1577.

Delos, or ORTYGIA (mod. *Dhilos*, a name which includes the adjacent island of Rhenea), an island in the Ægean Sea, forming one of the group known as the Cyclades, and lying to the N. of Naxos. Poseidon, according to legendary tradition, caused it to rise from the waters as a refuge for Leto when

pursued by the jealousy of Here. It was, therefore, held sacred to Phœbus (Apollo) and Artemis (Diana), the twin children of the fugitive, who were born there. So sacred was the spot that neither births nor deaths were permitted to take place in the island, and once in every four years a religious deputation was sent thither from Athens. The oracular shrine of Apollo on the western coast at the foot of Mount Cynthus was regarded as one of the Seven Wonders of the World. Though Darius and Xerxes respected the sanctity of the spot, it was devastated by Mithridates and never recovered. In the 2nd century B.C. it was a great slave mart. It is now uninhabited, though shepherds from the adjacent islands now and then bring their flocks over.

Delphi, or PYTHO (mod. *Castri*), a town of ancient Greece, in Phocis, at the foot of Mount Parnassus, eight miles from the shore of the Gulf of Corinth. It was the great centre of Greek religion, the seat of the most famous oracle and temple of Apollo, the meeting-place of the Amphictyonic Council, and the scene of the Pythian games. It was specially influential in the history of Greek colonisation (since the priesthood who directed the oracle obtained from their numerous visitors the best available geographical information) and during the 6th and 7th centuries B.C. in directing Spartan policy. The prophetic responses of the priestess, who had her seat on a tripod at the mouth of a vapour-breathing cave, were sought not merely by Greeks but by envoys from barbaric nations, and costly gifts poured in from all quarters to enrich the altar of the god. In earliest times the oracle generally delivered itself in verse, but the source of all poetical inspiration found it difficult to satisfy later critics, and fell back, therefore, on prose. The last utterance delivered from the shrine was a wail of despair elicited by Julian the Apostate (362 A.D.) when he purposed to restore the ancient temple, which had frequently been pillaged and destroyed. Excavations have recently (1892) been undertaken on the site under French auspices.

Delphinapterus. [BELUGA.]

Delphinidæ. [DOLPHIN.]

Delphinium. [LARKSPUR.]

Delta, so named from the resemblance in form of that of the Nile to the triangular Greek capital letter D, Δ, is a tract of flat land of alluvial origin, formed by the advance of the fan-like cones of sediment carried down by a river into a lake or the sea. These accumulations cause the stream to subdivide repeatedly, so that the triangular plain with its apex pointing up-stream is traversed by innumerable tortuous water-channels. These are constantly silting up, while new ones are cut through the soft earth. The delta of the Nile is the whole of Lower Egypt below Cairo; that of the Rhine includes all Holland: the Rhone has two deltas, one at the head of the Lake of Geneva and the other below Avignon: the delta of the Tiber advances 10 feet annually; and that of the Mississippi, covering 40,000 square miles, gains 86 yards a year.

Delta Metal, an alloy used for various parts of machinery. It is similar in character and behaviour to phosphor-bronze, being a brass into which manganese and a little silicon have been introduced.

Deltidium, the triangular area between the beak and the hinge of the larger valve of Lamp Shells and other Brachiopoda (q.v.).

Deluge (Lat. *diluvium*, flood), a term applied specially to the great flood recounted in Genesis vii., viii. The traditions of many nations, however, refer to a similar deluge. The *Chaldean Account of the Deluge*, discovered and published by Mr. George Smith in 1872, exhibits striking resemblances to the Biblical account, but is, of course, markedly polytheistic. An Indian tradition not found till the 12th century A.D. is almost certainly derived from the Chaldean. The best-known Greek deluge-myth is that of Deucalion (q.v.). Numerous deluge traditions exist also among the North American Indians and the Polynesians, but must be received with some suspicion, having probably in some cases been suggested by the incautious questioning of the missionaries. The question whether the deluge was total or partial has been much discussed. The geological difficulties in the way of the former view are so considerable that commentators incline to the latter.

Demavend, MOUNT, a volcanic cone said to form the highest point (20,000 feet) of the Elbruz range in Persia, 40 miles N.E. of Teheran. A town at the foot bears the same name, and is the capital of the province of Tabaristan.

Demerara, a river and a province in British Guiana, on the N.E coast of South America. The former rises in lat. 5° 20′ N., and, after a course to the N. of about 180 miles, flows into the sea between the Berbice and Essequibo rivers in lat. 6° 50′ N., long. 58° 20′ W., forming a broad estuary and being navigable for 100 miles. The province is the most central of the three that make up the colony of British Guiana (q.v.), and has a coast-line of 100 miles. Originally occupied by the Dutch, it was finally added to England by the Treaty of Paris, 1814. The soil is alluvial and rich near the coast; but about 20 miles inland there is a belt of sand, and beyond these rise steep granitic ranges, of which Roraima is the highest point. Georgetown, formerly Stabrock, the capital and the centre of government, is at the mouth of the Demerara river, which is guarded by Fort Frederick William, an obsolete structure, and is provided with a light-house. A railway connects the town with Mahaica to the east.

Demeter, in Greek mythology, was the personification of nature as the universal mother (Gk. *gē*, earth; *mētēr*, mother), as Zeus or Jupiter was the father of the air or firmament, both being the children of Chronos. Their union led to the birth of Persephone (Proserpina). When she was carried over by Aidoneus (Pluto), Demeter in her grief wandered over the earth, and threatened to starve the human race by refusing her kindly offices. Being welcomed with hospitality at Eleusis, she

favoured the spot ever after, and became associated with Dionysus (Bacchus) in the Eleusinian Mysteries. In many other places her worship was kept up, and she was identified with the Roman Ceres (q.v.). She was generally represented seated in a chariot drawn by dragons or fierce animals, bearing a basket on her head and some ears of corn in her hand.

Demetrius, son of Ivan IV. of Russia, was an infant at his father's death in 1582. His uncle Boris Grodonov put him to death in order to improve his chance of succession, and in consequence a number of pretenders adopted his name, one of them actually being acknowledged as Czar for a few months in 1605. The rise of the Romanoffs in 1613 put an end to the false Demetriuses.

Demetrius Phalereus, born at Phalerum in 345 B.C., and gifted with high eloquence, joined the Macedonian party and was elected Archon in 317. During ten years he ruled wisely and prosperously; but the return of Demetrius Poliorcetes in 307 roused the dormant patriotism of the citizens, and he fled to the court of Ptolemæus Soter in Egypt. There he lived for a time in literary ease, and is said to have assisted in forming the Alexandrine library. His attempt to exclude Ptolemæus Philadelphus from the succession led to his banishment as soon as that monarch came to power. He retired to Busiris, where he died from the bite of an asp in 345. Of his many works only a treatise on rhetoric has been preserved, and that is of doubtful authenticity.

Demetrius Poliorcetes, who derived his surname, "the Stormer of Cities," from his military exploits, was the son of Antigonus and Stratonice. In 312 B.C., being then 22, he led an army against Ptolemæus Soter and Seleucus, and met with defeat at Gaza, but soon retrieved his losses. He then undertook the conquest of Athens with a fleet of 250 ships. He soon succeeded in expelling Demetrius Phalereus, Cassander's nominee, and in the following year wrested Cyprus from the Egyptians. Then followed his famous siege of Rhodes, and after bringing the island to terms he returned to Greece, crushed Cassander at Thermopylæ, captured Sicyon, Corinth, and Argos, and married Deidamia, the daughter of King Pyrrhus. In 301 he and his father were overwhelmed by a new combination of enemies at Ipsus, and, escaping with a considerable force, he went to Ephesus whence he renewed hostilities against Macedonia in the Chersonesus. Strengthened by an alliance with Seleucus, who married his daughter, he laid siege to Athens in 299 and was successful. Alexander, one of Cassander's sons, next invoked his aid against his brother Antipater. Taking advantage of this opportunity, he seized the Macedonian throne, and held it for seven years, but was driven out by Pyrrhus in 287. He was then kept in honourable confinement by Seleucus until his death, which was brought about by drinking and dissipation two or three years later. He was noted for his physical beauty.

Demetrius I., surnamed Soter, was the son of Seleucus Philopater, whom he succeeded on the throne in spite of opposition. He engaged in a war against the Jews, and Judas Maccabæus was killed in resisting him. He himself was put to death by a confederation of neighbouring sovereigns in 150 B.C.

Demetrius II. (Nicator), son of the preceding, was reinstated in power by Ptolemæus Philomater, his father-in-law. His idleness and dissipation caused him to be driven out, and he took refuge with the Parthians, marrying a Parthian princess, whilst his own wife attached herself to his brother Antiochus, who was killed in battle. Demetrius now returned, but found little favour with his subjects. Compelled once more to fly, he was killed by the order of his first wife in a temple at Tyre (126 B.C.).

Demidoff, the name of a wealthy Russian family founded early in the 18th century by a native of Tula, who won the favour of Peter the Great by his skill in casting ordnance. In 1725 he discovered the gold mines of Kolyvan, which enormously enriched his descendants.

Demidoff, NICOLAS NIKITICH, the grandson of the foregoing, was born at St. Petersburg in 1774. He devoted himself to the scientific management of his vast mineral property, and to the improvement of the condition of his workmen and tenants. In his later years he settled down at Florence, where he surrounded himself with literary and artistic friends, and died in 1828. His two sons, Paul and Anatole, were well known personages in Paris during the Second Empire. The latter married Princess Mathilde, daughter of Prince Jérome, but was separated from her and died in 1870.

Demi Monde (originally the title of a play by the younger Dumas) a French term literally meaning "people only half in society," applied by custom to fast women of loose morals made conspicuous by the splendour in which they live, a specially prominent class under the Second Empire in France.

Demiurge (Greek *an artisan*). According to the Neo-Platonists and some of the heretical sects whom they influenced, *e.g.* the Gnostics, the Supreme Deity did not himself make the world, for there was an evil element in it, matter, by which he would not be polluted. He therefore created an inferior spirit, the Demiurge, to work out his designs. Sometimes this spirit was treated as the world-soul, and commonly was identified with the Supreme God of the Jews.

Demmin, the capital of a circle and government in Pomerania, N. Germany, is situated at the junction of the Tollense and Trebel, 73 miles W.N.W. of Stettin, near the Kummeron Sea. It was in ancient times a fortified post and has stood many sieges. Hats, woollen fabrics, linen, leather, beer, and spirits are manufactured here, and some trade in corn is carried on by sea.

Democracy (Greek *dēmos*, people; *krătos*, strength, power), a government controlled by the

whole, or the great bulk, of the citizens of the state, either by their direct participation in legislation and in exercising the executive and judicial powers (primary democracies), or by electing the legislature and the chief functionaries of government (representative democracies). The democracies of ancient Greece and Italy were all primary; modern democracies are representative with such partial exceptions as are due to the existence of the referendum and Landesgemeinde in Switzerland. The principles of Greek democracy according to Aristotle are that "the people take part in decision [on the affairs of state] and [the work of] government," and "that each citizen is in turn ruler and subject." Practically the latter principle was applied so literally that (*e.g.* at Athens) the administrative work was mostly done by large Boards, and the members of these and most of the minor functionaries were drawn by lot, so that every citizen had his chance of office. Both civil and criminal cases, too, were tried (at any rate in the last resort) by popular courts, which in fact were committees of the assembly. Periodically the whole body of citizens met in this assembly to legislate and decide important affairs of state (*e.g.* as to a declaration of war). The minor business of government was managed by a sort of standing committee chosen annually by lot. With some variations, the case was the same in other Greek democracies. None, however, included the whole male population, there being many slaves and often many foreign residents; the citizens were, in fact, a kind of privileged corporation. These democracies (according to Aristotle) tended to pass under the control of the poor and the town loafers, whose attendance at the assemblies was stimulated by payment, whereas the men of property were often too busy to come. The State revenues, it must be remembered, were derived largely from State property, not from direct taxation, and it seemed fair that those who gave their time to the State's business should have a share in them. The poor (according to Aristotle, but we do not know enough about the many Greek constitutions from which he generalised to verify his assertion) used their power to oppress the rich. It is certain that the latter were constantly trying to abolish democratic government, and that there were frequent revolutions.

The only approach to primary democracy now is in some Swiss cantons (Uri, Unterwalden), where the whole citizen body meets annually to legislate, vote money, and elect magistrates; but these are not sovereign States. [SOVEREIGNTY, FEDERATION.] Modern democracy grew up out of the institutions (copied from the British Government) of the States of the American Union after the Revolutionary War. These had representative government with legislatures elected by the bulk of the citizens, but the suffrage was not universal. One party in the States, however, following Thomas Jefferson (q.v.), was much influenced by the political doctrines of contemporary France, especially of Rousseau. These doctrines, whose development from theories of Roman law has been traced partially by Sir Henry Maine, are for our present purpose reducible to this—that all men are by nature free and equal (*i.e.* either were so originally, or ought to be), and that a just State should recognise their equal claims. Partly from these ideas, partly from the advance of education, partly, no doubt, from the needs of one or other political party, the franchise was gradually lowered in the various States until suffrage became practically, without exception, universal in all. At the same time the elective principle has been considerably extended, in many states even to judges, while the double election to the Presidency has become a mere form. Criminal prosecutions are undertaken in the name of the people (instead of the Crown, as in England). The Constitutions of the States, when revised, are commonly subjected to a direct popular vote, and some of them explicitly assert the equal rights of all citizens.

Ancient Rome was a primary democracy, as were many other Italian towns. In the mediæval cities of Germany and Italy there were approaches to primary democracy. In France during the Revolution, and again from 1848 to 1851, there were attempts at a representative democratic republic. At present, France and Switzerland are the European instances of this; but democracy, which Rousseau, writing in 1762, thought possible "only for the gods," is thought by most persons to be the goal of all European states. The suffrage in nearly all is now either universal or nearly so, and the popular element in all modern monarchies (save Russia) practically far outweighs the hereditary in importance. In America monarchy seems quite out of the question; in England the power of the Crown at present is little more than nominal. It need hardly be said that the growth of education, the newspaper press, the railway, the telegraph, have been leading factors in the development of popular power. As a means of administration, it must be admitted that a despotic government *may* be better than a democratic, since it can act with greater rapidity, and there are fewer people to convince of the need of a change. One recent writer, M. Leroy-Beaulieu, thinks that on this ground democracies may some day give place to administrative monarchies, as the Roman Republic gave place to the Empire. But the dangers of tyranny and jobbery are partly provided against by the publicity of democracies.

The common charge of fickleness against democracies strictly applies only to primary democracies, assembled all together in one meeting and easily swayed by sudden feeling. The complexity of a modern society, in which conflicting interests check one another, keeps modern democracy from this danger. Indeed, Sir Henry Maine, in his last work, urged that the natural tendency of a democracy was to apathy, and that in practice this was only counteracted by the existence of party passion and by corruption—not necessarily by direct bribery, but by the State benefiting the masses at the expense of the rich. This apathy can only be counteracted by (1) a high degree of popular education and intelligence, (2) the presentation of great issues to the electors, and (3) a high moral standard. But the consciousness

of each elector that he can bear his part in shaping the policy of his State, and, if he have the ability and opportunity, in directing it in some official capacity, should counteract the indifferentism which is the root of most evil in politics.

Democratic Party, THE, in U.S. history, was originally called Republican. It took the name Democratic Republican in sympathy with French revolutionary ideas, and the secession of a body of "National Republicans" in 1829-30 (who soon disappeared) caused the remainder to be called Democrats. It has always supported popular sovereignty and therefore State rights, as against centralisation; and as the Federalist policy was originally protectionist, it has on the whole favoured free trade. It was much aided by the popularity of Jefferson (q.v.), by the war of 1812-13 with England, and by the application of the "spoils system" by President Jackson in 1829 to the distribution of office. By 1852 it had become the pro-slavery party in consequence of its doctrine of State rights. This led to a threefold split [DOUGLAS, BELL, BRECKINRIDGE], the consequent election of Lincoln (q.v.), and the War of Secession. Throughout this war the Extreme Democrats of the North and West were more or less hostile to the Government (whence their nickname "Copperheads," a species of venomous snake), and after it to the system of reconstruction adopted. Their power did not revive till 1874, but probably fraud alone prevented their success at the Presidential election in 1878. At the 1882 election they carried Cleveland (q.v.). On the whole they now tend to support free trade, or at least a "tariff for revenue only," and are perhaps less inclined to economic heresy than the present Republicans (who as a party only date from 1856). In some cities, notably New York, the Democrats have been disgraced by alliance with the worst elements of corruption. [TAMMANY HALL.]

Democritus was born of a wealthy family at Abdera, in Thrace, early in the fifth century B.C. He is said to have derived some speculative notions from Magi left behind by Xerxes, and also to have heard Anaxagoras and Leucippus. Having spent his patrimony in travel, he returned to his native land and delighted his compatriots by reading one of his treatises; but he refused to take any part in public affairs, led a roving, solitary life, and died at an advanced age about 387 B.C. We only know his views by tradition. He is supposed to have derived them from Leucippus, and Epicurus was much indebted to them. According to him, the universe, self-existent eternally in the future as in the past, was composed wholly of atoms suspended in space. All material and mental phenomena he traced to combinations and motions of these particles, which were governed by the law of necessity. Sensation, in his view, was caused by constant emanations from bodies (*eidōla*), and the notion of the gods was derived merely from magnified impressions of the human figure. The supreme object of life he regarded as the attainment of a state of placid quiescence, which he termed *euthumia*. He seems also to have preached cosmopolitanism, and ridiculed Greek patriotism. From his tendency to ridicule the follies of mankind he earned the name of "The Laughing Philosopher." He is not mentioned by Greek contemporaries, but his influence on later thinkers was considerable. Lucretius borrowed from him through Epicurus, and Cicero speaks of his writings with admiration.

Demography (Greek *demos*, people; *graphō*, I write—like most scientific terms formed from Greek words, its correctness is questionable), descriptive sociology based on statistics. Thus Mr. Charles Booth's inquiries into pauperism, or investigations of variations in the death-rate or the average of suicide, might be included under the term. It has, however, been specially applied to sanitary science. An "International Congress of Hygiene and Demography" was held in London in 1891. The word is recent, and of foreign origin.

Demoiselle, a popular name for two species of Crane (*Grus virgo* and *G. paradisea*), sometimes made a separate genus (*Anthropoides*) on account of the short bill, long ear-tufts, and pendant breast-plumes. The first, about 3 feet long and $3\frac{1}{2}$ feet high, with grey plumage, white ear-tufts, and black breast-plumes, is a native of Africa and Asia, visiting the South of Europe. Stanley's Crane (*G. paradisea* = *A. paradiseus*), from the East Indies, has bluish-grey plumage, and is somewhat larger.

Demoivre, ABRAHAM, was born of Protestant parents at Vitry, in France, in 1667. The revocation of the Edict of Nantes forced him to migrate in 1685 to London, where he became the friend of Newton, and was elected Fellow of the Royal Society. His reputation as a geometrician was so high that he was invited to adjudicate on the claims of Newton and Leibnitz to the invention of the method of fluxions. His strength lay in the application of analytical processes, and his name is associated with a theorem that advanced materially the utility of trigonometry. Three important works were published by him, viz. *Analytical Miscellanies*, *The Doctrine of Chances*, and *Annuities on Lives*. The last contained an enunciation of his well-known hypothesis that of eighty-six persons born one dies every year till all are extinct. It also brought upon him a controversy with Simson, in which he got the worst of the argument. He died in 1754.

Demonology, the science or doctrine of spirits. The term is also used to express commerce with spirits (generally in a bad sense), and has been employed as a title for various works on the subject, notably for that written by James VI. of Scotland towards the close of the 16th century. The word *demon* has suffered degradation in meaning. In Greek *daimōn* was a generic and not a specific term, and meant "a deity, a spirit." The Greeks had separate terms (*agathodaimōn*, *kakodaimōn*) to denote a benevolent or good and a malevolent or evil spirit. Under ANIMISM (q.v.) the origin among races of low culture of the belief in souls, as generally accepted by anthropologists, is treated of. When this belief became current, all nature was imagined as peopled with invisible but powerful beings, who caused all natural phenomena; and as

these phenomena were beneficial or the reverse the beings supposed to preside over them were conceived as benevolent or malignant, and, therefore, to be honoured or appeased. And, as among men, some were greater and more powerful and others wiser and better than their fellows, a similar state of things was conceived as existing among spiritual beings. There is a curious passage in Porphyry bearing on this point:—"Demons are naught but the souls of men departed which either through pity of their friends yet living help and assist them, or else persecute their enemies whom they hated." Here we have the idea of two opposite classes of spiritual beings evolved from the notion of the continuity of human life. Apuleius, prior in date, goes farther than Porphyry, for he says:—"Those mortals are called gods, who, having lived prudently and justly, are honoured with temples and rites, as is Osiris in Egypt." This will help us to understand the gross actions attributed to the deities of many mythologies, who were, in truth, only exaggerated men and women.

In very early times the belief arose that disease was the work of evil spirits, and such words as *catalepsy*, *epilepsy*, and *nympholepsy* show that the same idea was prevalent among the ancient Greeks. It still lingers in its grossest form among many savage races. In the New Testament we have accounts of demoniacs, or persons possessed by demons; and in the Roman Church a form for casting out devils is retained in the *Rituale*, and the Order of Exorcist still exists as one of the Minor Orders received by every Roman cleric, though the office of exorcising is rarely performed except by priests, with the express sanction of the bishop.

The Demon of Socrates is generally spoken of as a kind of guardian angel. This seems to be an error. Socrates nowhere speaks of a *being*, but of a *supernatural something*, which restrained him in certain cases from acting, though it never prompted him to act (*Lewes: Hist. Philos.* i. 174). Nevertheless, there is little doubt that from the good demons of the Greeks and the good genii of the Romans the early Christians took their idea of guardian angels; while the evil demons and evil genii were unceremoniously classed with the minor devils, and to these the name *demons* is confined in theology.

What may be called legitimate communion between mortals and spiritual beings is religion; illegitimate intercourse gave rise to magic and witchcraft (q.v.). With all these demonology is concerned.

From what has been advanced concerning the evolution of the idea of spirits and gods, it will not be surprising to find that the notion of sexual commerce between mortal and spiritual beings is found in all religions. At one time it was the fashion to allegorise the amours of the classic deities. Until the rise of Neo-Platonism the ancient philosophers did not do so; and if one considers that these deities were merely sublimated men and women of like passions with ourselves it will not be difficult to see how such stories arose. We may cite the cases of Venus, who became the mother of the "pious Æneas" by Anchises, and who protected him against the unrelenting hate of Juno; and Dido, who when abandoned by the same Æneas, slew herself, that her angry ghost might avenge the wrong he had done her. The myth of Lilith, Adam's first wife, who bore him.

> Shapes that coiled in the woods and waters,
> Glittering sons and radiant daughters;

and who, when Eve was created, borrowed the form of the Serpent to betray him, is found in the Talmud, and is generally known to English readers through Rossetti's ballad *Eden Bower*. This myth is closely connected with that of the classic *lamia*, a spirit which assumed the form of a beautiful woman, sometimes with a serpent's head, in order to win the love of men, and then destroy them.

Hence came the notion of *incubi* and *succubi* (male and female demons that consorted with mortals in their sleep, and thus became fathers and mothers). Readers of Scott will remember that Brian the Hermit, in the *Lady of the Lake*, was the son of an incubus; and in *Glenfinlas* the poet makes use of similar supernatural machinery, though his "Ladies of the Glen" seem to have been connected with *lamias* rather than with *succubi*, who are rarely, if ever, credited with destroying their consorts.

Besides these, it was believed that there were demons animated with special hatred of the human race, whom they regarded as their peculiar prey. Such a notion may well have arisen from that of the old nature-deities, who were supposed to preside over all natural phenomena, and to dwell in the air, the sea, the streams, the woods. Each faith has its own demonology, to which reference will be made in its proper place.

Some demons are imagined as assuming the forms or actually inhabiting the bodies of some of the lower animals. Thus the serpent in Genesis is popularly supposed to have been the Devil; Milton also makes him assume the form of a toad, "squat . . . close at the ear of Eve." In the seventeenth century, cats, flies, and lice were said to be the forms in which the familiar spirits of witches and wizards appeared to those whom they served. The superstition about the cat still lingers in remote country districts in England; examples of the other cases mentioned will be found in the *Alchemist* and *Hudibras*, and on this part of the subject De Gubernatis' *Zoological Mythology* is an excellent authority.

As Animism led man to the notion of a Supreme Deity, so it also contributed to the notion of the Chief Demon—the Devil or Satan of Christian theology. The "devils" of the Old Testament are the false gods of the surrounding heathen nations, and the Satan of Job (i. 6, ii. 1–7) appears among the sons of God, who in other passages are represented as the messengers of Jehovah. He is also said to have provoked David to number the people of Israel (1 Chron. xxi. 1), and to have resisted Joshua, the high priest—seen in a vision by Zechariah (iii. 1). The mention of him in the Psalms (cix. 6) is of doubtful meaning, as the word is glossed in the margin "an adversary," and is probably not a proper name. These are the only instances in which the word occurs in the Hebrew Scriptures. In the

New Testament the Devil is represented as the chief of the fallen angels, and as "the implacable enemy and tempter of the human race, especially believers, whom he desires to devour." The idea of an immortal embodiment of evil, only less powerful than the Supreme, oppressed the minds of some men with a natural terror, and a way out of the difficulty was early found in a kind of Universalism (q.v.). [ORIGEN.]

The popular conception of the Devil is a very mixed one. His general form is derived from the satyrs of Greek mythology; his tail is probably due to the description of the dragon in the Revelation (xii. 3); his black colour may be symbolical of evil, but may be suggestive of his abode, and the trident-like weapon with which he is generally armed may be a reminiscence of some classic deity —for the early Christian degraded these into devils. He was undoubtedly an object of terror, but this feeling was not unmixed with a tinge of contempt at his want of foresight and caution, for mediæval folklore abounds with tales in which he appears as being outwitted by the most transparent devices. An instance is readily accessible in Longfellow's *Golden Legend*, where the Devil consents to allow the bridge built by Abbot Giraldus at Lucerne to stand on condition that the first living thing that crossed should belong to him. The Abbot, when the bridge was completed, threw a loaf of bread across, after which a hungry dog greedily sprang, and so the Devil was outwitted.

Demons, with their Chief, might be summoned by charms and invocations, and made to obey the commands of those who raised them. Compacts might be made with them in which man's future happiness was to be bartered for material advantages in this life. The legend of *Faust* is based on this belief, and the subject will be better dealt with under that heading. [FAUST.]

De Morgan, AUGUSTUS, was born at Madura, South India, in 1806, and, going to Cambridge, came out fourth wrangler. He began to study for the bar, but in 1828 was appointed to the chair of mathematics in University College, London, then recently established. He was a voluminous writer on mathematical subjects, and occasionally dealt with astronomy, logic, and biography, exercising his abilities also as a professional actuary. He was a keen advocate of decimal coinage. His *Essay on Probabilities* and *Treatise on the Differential and Integral Calculus* are still in use. In his later years he published, under the title *Formal Logic, or the Calculus of Inference*, an ingenious but not very successful attempt to throw all reasoning processes into a mathematical form, now superseded, to a great extent, by the labours of Boole (q.v.). A controversy with Sir William Hamilton ensued, and, like other disputes in which De Morgan was involved, hardly enhanced his reputation. His *Budget of Paradoxes* (1872) is an amusing collection of the eccentric theories of circle-squarers and other scientific heretics. In 1866 he abandoned his professorship, on the curious plea that by not electing Dr. Martineau to a professorship because he was a minister of religion, the college had shown itself sectarian. He died in 1871. Latterly he paid much attention to spiritualism.

Demosthenes, the son of a prosperous armourer at Athens, was born about 385 B.C., and first gave proof of forensic ability, at the age of 20, by prosecuting Aphobus, his guardian, for embezzling his patrimony. An impediment in his speech retarded for some years his success in addressing popular assemblies; but by unremitting practice, including, it is said, the curious exercise of shouting down the roar of the waves with pebbles in his mouth, he overcame his natural defects. Before he was 30 he had gained the public ear, and soon became the recognised leader of the anti-Macedonian party. In this capacity he composed the powerful series of orations by which he roused his countrymen to resist the encroachments of Philip. The *Philippics* and *Olynthiacs*, still extant, quite justify the eulogies of antiquity. To him was largely due the league with Thebes, resulting in the disastrous battle of Chæronea (338), in which he personally took part. At the death of Philip he renewed his patriotic efforts against his successor Alexander, but he failed to bar the triumphant progress of the young conqueror. His old adversary, Æschines, on the proposal of Ctesiphon to vote Demosthenes a crown, denounced his policy and charged him with cowardice and treachery at Chæronea. The reply, known as the speech *De Coronâ* (330), reviewing his whole political career, is his acknowledged masterpiece. He was not, however, so fortunate in refuting an accusation of having received bribes from Harpalus, and to avoid the penalty following on conviction he fled to Ægina. When Alexander died, he returned and induced the Athenians to declare war against Antipater. The defeat at Crannon once more shattered his hopes. He took refuge in the temple of Poseidon at Calauria, where, fearing to be surrendered to the conqueror, he took poison and died in 322. A statue was erected to his memory at Athens, and his eldest child was brought up at the public expense. The sixty-one orations that have come down to us give a high idea of the intellectual power and consummate skill with which they were prepared. Combining rhetoric in its noblest form with an unbroken succession of logical arguments, these addresses remain unsurpassed models of the most exalted eloquence. If we may believe tradition, they were delivered with a force and a majesty of which it is difficult to form any adequate conception.

2. One of the ablest Athenian generals in the Peloponnesian war. He defended Pylos against the Spartans in 425 B.C. The success for which Cleon was belauded must probably be attributed to him. In 413 he was sent out with Eurymedon to relieve Nicias at Syracuse, and perished with the other members of the expedition.

Dempster, THOMAS, was born at Cliftbog, Aberdeenshire, in 1579. He began his education at Pembroke Hall, Cambridge, and continued it in a very erratic fashion at Paris, Louvain, Rome, Douai, and Tournay. He then got the professorship of eloquence in the Protestant Academy of Nimes,

but resigned it two years later in consequence of a quarrel, visited Spain, returned to Scotland, and finally settled in Paris. His learning won him several appointments, notably that of president of the College of Beauvais. In 1615 James I. invited him to London, but he left in disgust, and next appeared in Italy. Here he obtained a chair in the University of Pisa, but his temper again marred his career. His last days were spent at Bologna, where his wife eloped with a student, an event which brought on a fever and caused his death in 1625. He left many works, the most noteworthy being the *Historia Gentis Scotorum*.

Demulcent, a non-irritating substance used for application to mucous membranes which are inflamed or dry from deficiency of the natural secretion; *e.g.* barley-water, gruel and various preparations of gelatine starch, or albuminous fluids.

Demurrer was that pleading to an action by which one of the parties refused, *i.e.* demurred, to proceed with the pleadings towards trial, and required the judgment of the Court whether, upon his opponent's own showing, a sufficient or satisfactory statement had been made in law to entitle him to sustain or rebut the action as the case might be. In civil actions this particular form of pleading has been abolished; but points of law are now allowed to be raised on the pleading of any party, to be disposed of before trial, by order of the Court or a judge; and pleadings may be struck out if they disclose no reasonable cause of action or answer. In criminal prosecutions a demurrer may be resorted to when the fact as alleged is allowed to be true, but the accused takes exception in point of law to the sufficiency of the indictment or information on the face of it, as if he insist that the fact set forth is no felony, treason, or whatever it is alleged to be.

Denain, a town in the department of Nord, France, 14 miles east of Douai. It has grown into importance during the last fifty years, owing to the development of coal-mining and of the industries connected therewith. Its position on the Northern Railway and the Scheldt Canal gives it commercial facilities. Here Marshal Villars defeated Prince Eugène in 1712.

Denarius (Latin *deni*, ten apiece), the chief silver coin of ancient Rome, first coined in 269 B.C., and originally of the value of 10 *asses* (whence its name). [As.] After the as was reduced in weight, between 264 and 241 B.C., 16 asses went to the denarius. Under the Republic (judging from existing specimens) it usually contained 60 grains of pure silver; under the Empire, $52\frac{1}{2}$. Its value is usually stated as between $7\frac{1}{2}$d. and $8\frac{1}{2}$d. (or with silver at 40d. per oz., from $4\frac{3}{5}$d. to 5d.).

Denary Scale is the scale of notation in general use for the expression of number. The base of the system is the number 10, the position of the digits indicating the power of 10 by which each is multiplied. Thus the expression 3574 signifies, in the denary scale, the number $3000+500+70+4$, the 3 being multiplied by the cube of 10, the 5 by the square of 10, and so on. The system of decimal fractions is thus only an extension of the denary scale to represent fractional numbers. [Decimal Fractions, Notation.]

Denbigh, the county town of Denbighshire, N. Wales, stands in the deep valley of the Clwyd, 30 miles W. of Chester, on the Great Western and North Western Railways. On a rock round which the houses cluster stand the ruins of the castle of Lacy, Earl of Lincoln, and there are also traces of a Cistercian abbey and Carmelite chapel. The town hall dates from 1572, and the grammar school from 1727. Howell's school for girls is a recent foundation of the Drapers' Company. Shoes and gloves are the only manufactures. The borough unites with Ruthin, Wrexham, and Holt to send a member to Parliament.

Denbighshire lies between Flintshire and Carnarvonshire on the coast of N. Wales, having a sea frontage of 9 miles, and an area of $612\frac{1}{2}$ square miles. Its surface is very diversified, as the inland portions are mountainous, but the hills are divided by fertile valleys broadening as they run towards the sea, the valley of the Clwyd being the most important. Agriculture prospers on these lower grounds, whilst the higher levels are rich in slate, as at Rhiwfelen and Glyn Ceiriog, paving slabs and millstones, as at Cefn Ruabon and Nantglyn, coal and iron, as at Ruabon and Brymbo. Though Denbigh is the capital, the largest town is Wrexham. Llangollen is much frequented for its charming scenery, and Llanrwst for its salmon and trout fishing. The county abounds in handsome and picturesque seats, chief amongst which are Wynnstay (Sir Watkin Williams Wynn), Brynkinalt (Lord A. Hill-Trevor), Gwydyr (Lady Willoughby d'Eresby), and Chirk Castle (Mr. R. M. Biddulph).

Dendera, an Arab village on the left bank of the Nile, 28 miles N. of Thebes, occupies the site of the ancient Tentyra, the centre of the worship of Athor, the Egyptian Aphrodite, whose splendid temple exists in almost perfect preservation. It dates from the early Roman Emperors and contains representations of Cleopatra and Cæsarion, her son by Julius Cæsar, of Domitian and of Trajan. The building, 220 feet long by 50 feet broad, is enclosed in brick walls 1,000 feet in length.

Dendrocœlida, a sub-class of worms of the class *Turbellaria* (q.v.), popularly known as Planarians; the group is characterised by the repeated branching of the intestine, and from this it receives its scientific name. The English species are all freshwater inhabitants, but in more tropical districts large Land Planarians are met with. [Planaria.]

Dendrocrinus, a genus of *Crinoidea*, or "Sea Lilies," and the type of the family *Dendrocrinidæ*. It is of interest, as to it is referred the oldest known Crinoid, *D. cambrensis*, from the Tremadoc rocks of Ramsey Island off the coast of South Wales; there can be little doubt, however, that the species does not properly belong to this genus.

Dendrophis, a genus of harmless Colubriform snakes, the type of a family (Dendrophidæ), with

six other genera, all tropical, but chiefly from the Oriental region. They are popularly known as Tree-snakes, are active, arboreal, slender in form, usually green in colour, and prey on tree-lizards.

Dendrophyllia is one of the best-known genera of the large branching compound corals.

Dengue, DANDY FEVER, or BREAK-BONE FEVER, an epidemic disease occurring in parts of India and in the East and West Indies. The chief symptoms of dengue are high fever, severe headache, pain and inflammation of the joints, and often on the third or fourth day of the disease there appears an erythematous eruption. On the sixth or seventh day of the disease the fever abates, but relapses are common. Dengue presents considerable similarity in many respects to relapsing fever. It is not often fatal.

Denham, SIR JOHN, the son of an eminent Irish judge, was born at Dublin in 1615. His father being transferred to the English Bench, sent him to Trinity College, Oxford, and he afterwards entered at Lincoln's Inn, but his passion for gambling brought him to the verge of ruin. In 1642 he astonished the world by producing a five-act tragedy, *The Sophy*, which deserves no great praise, and a descriptive poem, *Cooper's Hill*, that caught at once the taste of the age, and procured him the patronage of the king. He was employed in several missions abroad, from which he returned penniless. Moreover, his second wife was seduced by the Duke of York, an injury that was hardly atoned for by the comfortable post bestowed on him at the Restoration. His reason ultimately gave way, and he recovered only to die in 1668. His collected *Poems and Translations* appeared in the same year.

Denis, or DIONYSIUS, ST., the patron saint of France, is alleged by Gregory of Tours to have come from Rome to Gaul in the third century, and to have settled at Paris, of which city he was the first bishop. He suffered martyrdom by decapitation during Valerian's persecution in 272 or perhaps some years later. One legend represents him to have carried his head in his hands two miles after it had been severed from his body. Pious converts recovered his remains from the Seine, buried them, and erected a chapel over them. In the seventh century Dagobert converted this structure into the famous Abbey. Another story identifies him with Dionysius the Areopagite converted by St. Paul. His day is kept on October 9th.

Denis, ST., the name of the town that has risen round the Gothic abbey church referred to above. It is 6 miles N. of Paris, but is included in the outer line of fortifications. Factories for cotton-weaving, bleaching, and dyeing, and large chemical works maintain a considerable population of the working-class, and the suburb bears rather an evil reputation for crime and turbulence. The existing church, 415 feet long by 106 wide, built in the 12th century by Sucer, at the cost of Louis VII., has suffered much from revolutionary violence, but still preserves some of the rich and delicate features of the earlier structure. In the crypt below lie the remains of many of the French kings, whose statues from Clovis to Louis XVI., mutilated but restored, adorn the interior.

Denison, EDWARD, son of the Bishop of Salisbury and nephew of the three following, was born in 1840. He was educated at Eton and Oxford. In 1866 his attention was called to the state of the poor in the East End of London, and next year he established himself in Stepney, where he endeavoured to grapple personally with the problems of pauperism, thus constituting himself the pioneer of a movement which has since become widespread. He visited Paris and Edinburgh also in order to study the working of other than English systems of relief. In 1868 he was returned to Parliament for Newark, but his constitution gave way, and at the close of 1869 he set out on a voyage to Australia from which he never returned, dying at Melbourne in January, 1870.

Denison, GEORGE ANTHONY, the venerable Archdeacon of Taunton, was born at Ossington, Notts, in 1805, educated at Eton and Oxford, and appointed to the vicarage of East Brent, Somerset, in 1845. In 1853 he was charged with holding views on the Eucharist that were inconsistent with the teaching of the Anglican Church, and on his giving fuller expression to his opinions in three sermons on *The Real Presence*, he was, after a long inquiry before the Bishop of Bath and Wells, deprived of all ecclesiastical preferment. The Court of Arches reversed this sentence. That of Final Appeal confirmed the reversal, and the Archdeacon returned to his parish in triumph. He has been a consistent opponent of every movement towards Evangelical or Latitudinarian principles, condemning school boards, secular authority in the Church, *Essays and Reviews*, Colenso's Biblical criticism, and Mr. Gladstone's policy. On the other hand he warmly advocates an ornate ritual, the use of the confessional, and the revival of the mediæval authority of the Church.

Denison, RIGHT HONOURABLE JOHN EVELYN. [OSSINGTON.]

Denison, SIR WILLIAM, brother of Lord Ossington and of Archdeacon Denison, was born in 1810. In 1846 he was appointed Governor of Tasmania, and incurred unmerited ill-will through the removal thither of the convicts from the neighbouring colonies. In 1855 he was transferred to New South Wales, and the fortifications of Sydney were completed under him. His next post was the governorship of Madras (1861), and for a short time after the sudden death of Lord Elgin he acted as Viceroy. Retiring in 1866, he died in 1871.

Denka (DINKA), a large and formerly very powerful Negroid nation of the White Nile, whose territory extends from Mount Denka, lat. 12° N., along the right bank southwards to about lat. 5° N. They are thus conterminous with the Shilluks in the east, the Bari and Nuers in the south, and the Makarakas (Niam-Niam) in the west. There are a

great many tribal groups, of which the most important, going southwards, are the Abyalang, Ader, Abuyo, Donghiol, Bor, Aliab, Kich, Janghi, Rek, Aral, Ghok, Angach, Fuver, Jerut, Affot, Mandari, Nyal and Yom, all speaking closely related dialects of the common Denka stock language, and numbering about two millions. The Denkas are physically one of the finest races in Negroland, well made, tall (averaging 5 feet 10 inches), of chocolate complexion and modified negro features. They are exceedingly brave, as shown by the long wars they have sustained, armed only with spear, club, and shield, first against the Arab slave-hunters (1820–70) and again against the Egyptian forces led by Lupton and other European officers (1882–84). Their watery domain yields little but fodder, and they have long been famous as stock-breeders, possessing a magnificent breed of cattle, humped, like the zebu, and probably of Indian origin, though now widespread throughout the Sudan. Like the Hindus they never kill their cattle, which, according to Chaillé-Long, are even worshipped with divine honours. (*See* Schweinfurth, *Heart of Africa*, Beltrame, *Grammatica della Lingua Denka*, and Junker, *Travels in Africa*, vol. iii.)

Denman, Right Hon. Thomas, Baron, was born in London in 1779, and received his early education from Mrs. Barbauld. He then went to Eton, and ultimately took his degree at Cambridge in 1800. Being called to the bar he soon obtained a large practice. He defended the Luddites, and with Lord Brougham was counsel for Queen Caroline. In 1818 he entered Parliament, but the king opposed his advancement. However, in 1830, Lord Grey made him Attorney-General, and two years later he succeeded to the Lord Chief Justiceship of the King's Bench. His elevation to the peerage followed in 1834. In 1850 he resigned, and died in 1854. His fourth son, the Hon. George Denman, now occupies a seat on the same bench.

Denmark. *Actual Condition.* Denmark is the relic of a former twin-empire of prehistoric Europe, viz. Gothland East and West, called respectively "Ey- (or Island) Gotaland" and "Reid-Gotaland" —the word "reid" answering to our *main* land, *terra firma*, by which the peninsula of Jutland is intended. But modern Denmark contains but half of that peninsula, South Jutland having been separated from the mother-country along with Slesvig-Holstein, and annexed to Germany at the peace of Vienna in the year 1864. The islands remain, and form a compact group on the eastern side of Jutland, at the entrance of the Baltic Sea. Of these, Sjoelland (or Sea-land), Fyen (called by the Germans *Funen*), Laa-land (Low-land), and Falster are the largest and most important. Bornholm, which lies yet eastward in the Baltic Sea, is one of the most interesting and impressive spots in the Danish dominions. These comprise the home-lands of Denmark; but Iceland and the Faroe Isles are subject to the Danish Crown, and it likewise owns colonies in Greenland and the three West India Islands of St. Croix, St. Thomas, and St. Jean.

The total area of the country is 15,289 English square miles, of which four-fifths is under cultivation, the remaining fifth being bog, sand, and heath. Jutland has more than its share of this barren land, some of it irreclaimable, although constant efforts are made to improve its condition.

Industry. The Danes supply their own needs and also export a considerable amount of corn. One-half of the population is constantly employed upon the land, of which 30 per cent. is arable, the rest (except what is waste) meadows and pasture. Dairy-farms are on the rise, and the annual output of butter has latterly increased sevenfold, owing to the introduction of superior methods. Cattle are well cared for, the numbers of horned beasts per head of the population being greater than in any other country of Europe. The Jutland breed is famed for its excellence. Danish horses are sought after, and there is a constant supply of sheep and pigs for export.

There are no coal-mines in Denmark, and no metals. Nevertheless about a quarter of the people are employed in manufactures, even with machine-making, the raw material being imported. In Bornholm is found the porcelain clay of which the beautiful Copenhagen china is made. There are glove factories at Randers in Jutland, also in Horsens on the coast, and in Odinsee, the chief town of Fyen. The Jutland cottage folk produce all sorts of knitted woollens, Jutland pottery, and wood-carving. Some lace is made near Ribe on the western coast; and hand-loom weaving only needs encouragement to revive the perfection of earlier days.

Character of the People. The Danes are brave, patient, and hospitable. They are thinkers and idealists, capable of a deep enthusiasm and steady persistence of aim. Their patriotism is strong but not all-absorbing, the spirit of deliberation and an observant habit leading them continually to learn from other nations. The popular taste is simple and cheerful, showing a proclivity for true art and literature. There is often found great poetic susceptibility, with the romantic consciousness of an ancient and unmixed people; but this is ordinarily concealed under a quiet, somewhat heavy demeanour, at times shadowed with melancholy. Yet all are receptive of new ideas and responsive to training.

Government. The Danes have had, since the year 1849, a written Constitution called the "Grund-Lov," or Fundamental Law. It was revised and re-issued in July, 1866, under Christian IX., the present king and father of the Princess of Wales. It appoints a Rigsdag—a parliament of two houses—as the supreme legislative authority, the king, aided by his ministers, having the executive power. It recognises a State Church, but defends the right of citizens to free worship and assembly, and guarantees State education, public control of taxation, right of appeal, and a system of poor-relief which assumes that those who are helpless, and whose maintenance is not legally devolved on any other, have a right to State support. The right of *Habeas Corpus*, the freedom of the press, education of the poor, communal or village government, are also protected. It also provides for the succession, and for its own revision from time to time, and allows the king to issue, in case of emergency, provisional laws to be laid before the Rigsdag assembled at the next opportunity.

The Rigsdag consists of—
I. The Landsthing, or Upper House.
II. The Folkething, or Lower House.

The Landsthing has sixty-six members, twelve of them chosen by the king, the rest by indirect representation from Copenhagen city and the country in districts (the people electing only electors, who then have to decide on their own representative). These are chosen for eight years, and at the end of every four years half the number retire. They must be over forty years of age, and hold a certain amount of property. The Folkething is elected, one member to every 16,000 of the population, every three years, directly by universal suffrage. Those who have received State assistance are not entitled to vote, unless they have paid off their relief.

The king is assisted in his duties by a State Council of seven departments:—(1) The Ministry of Finance; (2) The Ministry of the Interior; (3) Ministry of Justice (under which Icelandic affairs are regulated); (4) Foreign Affairs; (5) War Department; (6) Marine; (7) Public Instruction and Ecclesiastical Affairs. All the ministers can be impeached before the Folkething, and it alone can pardon them.

Denmark is divided into 18 "Amter," or counties. The Amtmand is the lord-lieutenant. These are divided again into 126 "Herreder," or hundreds, each with a "Birkedom," or justice of the peace; these once more into parishes, of which there are about 1,068. Copenhagen forms a county of itself, and has its own government of councils carefully and constitutionally arranged; but the smaller towns are governed by a mayor and aldermen appointed by the king.

Church and Education. The Established Church since 1536 is the Evangelical Lutheran, to which ninety-nine out of every hundred Danes adhere. But there is complete religious toleration provided by clauses in the Constitution. No one need contribute to any form of worship except his own; yet a citizen who does not belong to any of the recognised religious bodies must still pay a contribution for public education. Jews, Baptists, and Roman Catholics, Calvinists, Mormons, and Irvingites are found in Denmark, especially in Fredericia; but none are numerous, every allowance being made for variety of opinion in the Church-body itself. Thus, since 1868 it has been lawful for any twenty families, if they wish, to separate themselves and retire from the congregation, though not from the State Church, electing and supporting a minister of their own choice. Also, from the Reformation period onward, if not before, every parish has had legally an opportunity to reject a candidate for the priesthood appointed from without, before his ordination as their pastor.

There are seven bishoprics—See-land, Laa-land, Falster, Fyen Aalborg; and Vilborg and Aarhus and Ribe in Jutland. The bishops have borne an active part during this whole century in the work of national instruction, and their sanction, in the form of a good certificate at Confirmation, is consequently valued as a proof of a finished education, and is still expected of a candidate for any public office or even for the professional career. Education is compulsory and universal; there are free places in the public schools, but all are obliged to attend from seven to fourteen years of age.

Further advance is made by evening schools, and by over seventy private lecture associations, many of which receive State grants. Elementary teachers are trained in four royal training schools, and in private ones as well. There are King's Latin schools in almost every town, and private schools, also classical, in many places. Technical education has been attended to in Copenhagen, where a "Polytechnic" is a part of the University. There is a thriving school of agriculture. The Royal University itself was founded in 1479 by Christian II., but did not do much until after the Reformation. It has now over forty professors, and nearly 1,300 students. Since 1875 women have been admitted

MAP OF DENMARK. *TypoEtching Co. Sc.*

to its curriculum and degrees. There have always been endowments for the residence of poor students, who have frequently turned out great men.

Army and Navy. The "Landsoldat," or militiaman, who dies for his country in the spirit of a volunteer, is the typical defender of Denmark. Conscription is employed; every young man of twenty-two being liable for service for eight years in the Regular and eight more in the Reserve Forces. They are from six months to a year in training, and afterwards it is enough (in times of peace) if they are called in for drill every two years. The Navy is manned by 6,000 men regularly, and as many more in reserve. Copenhagen is the only fortified place in the country, and during the last few years has been building forts on its landward side; but not by the wish of the whole nation, the king having employed his prerogative in order to raise the necessary funds for this purpose.

Art and Literature. The history of Danish art begins at a very early date. Runic carvings are found of the ninth century, in the form of a monumental monolith not unlike those of north-east

Scotland. Metal work of that age, and earlier, is to be seen in the Royal Museum of Antiquities, one of the most famous depositories in all Europe, and admirably arranged for the study of prehistoric times. Church-building began in wood, but cathedrals were built, about the year 1100, of tufa imported from the Rhine, of which the remains may be seen at Ribe. Stone was used next, and later brick, as may be seen in Sorö and Ringsted. Kalundborg church (near Ribe in Jutland) and the round churches of Bornholm and several other places are almost unique. Roskild cathedral, the burial-place of Danish kings, dates from 1200. The Gothic style is hardly visible in Denmark, the country having lapsed in the 13th century into dismal poverty. With the Reformation came the revival of architecture as of learning, and now we find not churches but castles. Kronborg Castle, which Shakspeare chose for the scene of Hamlet's youth and despair (presumably because of its site); "Elsinore," a landmark to the British seaman; Christiansborg, the splendid and symmetrical pile that greets the traveller arriving at Copenhagen by sea, floating, to all appearance, upon the surface of the still harbour; Rosenborg, built by Christian IV., maternal uncle to our Charles I., all testify to a succession of energetic royal ideas.

In painting and sculpture the Danes have been earnest students since 1754, developing a national taste on the best models. Carstens and Thorwaldsen respectively represent the first outburst of genius in these two lines. Eckersberg, who worked in Paris under the great David, was able to establish early a school of faithful realism, at a time when the rest of Europe ran wildly into the fantastic-romantic. Marstrand has followed him with the purest watercolour. The eventful and historic struggle for the fatherland broke up all former tradition and gave rise to new and original feeling, alike in pictures, music, and books. The literature of the olden time, in the form of priceless manuscripts from northern pens in the Dark Ages, revised and annotated. is the peculiar treasure of Copenhagen. Upon this a secondary literature of ballads, written down in the Middle Ages, and a recent outgrowth of romantic fiction, from Ingemann and Blicher, have developed in succession, all going to prove the firm hold which the former time has upon the popular mind, and at the same time securing that hold. More recently the drama has taken up the same subjects, and has evolved from its study of history a moral seriousness of intent, and a deep resolve to instruct, which it is a little difficult for other countries to understand. Holberg is the master of Danish comedy, and he it was who first stimulated the real love of literature, and reasoned out a sober basis of solid thought for his gaiety and satire. Oehlenschlager was the first poet to take up the national traditions as a subject. Grundtvig, in 1809, began to rival him, but lapsed into earnest historical study, which has left a heritage to mankind.

As practical antiquarians Worsaae and Steenstrup have added much to the wonder-world of science by collecting and recording primitive relics. Hans Andersen has done almost as much in the realm of fancy, and has been translated into many languages with little loss.

In *Music*, Denmark gave birth to Weyse and Kuhlau, whose operas are but little known out of his own country. Hartmann is a diligent composer, and Niels Gade, who wrote his first works in Leipsic under Felix Mendelssohn, for many years presided over the *Musik Forening* (Musical Union) of Copenhagen. He died in 1892.

Scenery and Topography. Denmark has a miniature picturesqueness said to be unique. The mixture of land and water, and the proportions of the little hills and streams are very perfect, giving one a sense of variety and charm. On the mainland is found the Himmelsbierg, or Heaven mountain, with a clear lakelet at its foot, a forest surrounding the steep, and its bare brow commanding a view of many other eminences as modest as itself. Northward is found the contrast of moorland, wilderness, and sandy dunes, waging an unequal battle with winds and waves. No great convulsion of Nature, but a slow general upheaval of the land has been going on for ages, and is still in progress at the north end of Jutland. Nevertheless, the country is almost overblown with sandy drifts, which advance in weird grassy mounds gradually farther inland. The towns in the peninsula, save Viborg the ancient capital, are almost all found upon the sea coast. Ribe and Esbierg alone face westward to the fierce North Sea; the latter is sheltered by the isle Fanö; Aarhus and Horsens are on the Baltic coast; Randers a little way inland; Frederikshavn to the north; Aalborg is a gallant fishing-town on Lim Fiord. On the side of the Skaw (properly called Skagen) is the northernmost point of civilisation. A network of railways connects all these places, except the little Skagen colony; and Copenhagen is rapidly accessible by the aid of steamers across the Little and the Great Belt, *via* Odinsee, on Fyen, and Korsoer, where we alight on See-land, and pass in turn the famous places, Sorö, Ringsted, and Roskild, before arriving in the capital. Beechwoods and pine surround the little lake of Sorö, and smiling grazing ground ensues. One may observe cows grazing in circular patches, to which they are confined by a tether, under the charge of some careful child, who from time to time removes the peg and moves to pastures new. The air of general prosperity, economy, and thrift is very encouraging, in trim cornfields and gardens, orchards and groves, while the glimpses of winding salt sea fiord or "bugt" give flavour to the otherwise more or less insipid landscape.

History. This can be compressed into three periods. (1) That of the early kings, (2) the autocracy, and (3) constitutional times. From an early date the Danes elected their kings at a folk-moot or "Thing" in several parts of the country. In 1660 after an exhausting war with Sweden, supreme hereditary power was conferred by the people of Copenhagen upon their king, Frederick II. In 1831 Frederick VI. granted constitutional government again to the people, and a steady growth of liberal institutions has followed from that time to the present. There is much sympathy between the people and the throne, historically due to the part

played by the monarchs in the suppression of the nobles, who, as petty tyrants, were a heavy burden to the Commonwealth, and often involved the country in terrific broils. With the Duchies of Slesvig and Holstein the latest source of disturbance is removed, and a homogeneous and united people are free to fulfil the higher destinies of Denmark.

Ethnology. The Danes, who have from remote pre-historic times been in possession of Jutland and neighbouring islands, belong to the Norse or Scandinavian division of the Teutonic family. Formerly restless sea-rovers (Vikings), brave and intelligent, they overran a great part of the European coastlands from the British Isles and Normandy to Sicily, penetrating in one direction as far as Constantinople, in another into the heart of the Russian steppe; later they established their political supremacy over the whole of Scandinavia, and founded settlements both in the East and West Indies (Tranquebar, St. Thomas, etc.), on the west coast of Africa, and in Greenland. But in recent times, and especially since Denmark has been mainly reduced to its natural limits, the character of the nation has undergone a considerable change, and the Danes are at present described as a somewhat heavy, lethargic people, still brave, but pacific, patient, and unenterprising. Physically they are of middle size, generally well made, moderately robust, with mild, pleasant expression and fair complexion, though the blonde, blue-eyed, flaxen-haired, Danish type of earlier times has been considerably modified by intermixture with darker Germanic elements. The Danish language, which is current throughout Denmark and most of Norway, is derived directly from the old Norse, to which it bears somewhat the same relation in its simplified grammatical structure that English does to Anglo-Saxon. It has been cultivated for over three hundred years, though some of its most distinguished men of letters, such as Niebuhr, Forchhammer, Malte Brun, and Mommsen, have chiefly employed German, French, or Latin, at least in their more serious writings. The comedies of Holberg, the "Plautus of the North," have acquired a European fame, while astronomy, archæology, and philology, both classical and comparative, have been cultivated with brilliant success by men of undoubted genius, such as Tycho Brahe, Worsaae, Madvig, Rask, and Thomsen. Of the total population (2,170,000 in 1890), all are of Danish stock and speech except about 33,000 Germans, 24,000 Swedes, and 4,000 Norwegians, English, French, etc. There are also 140,000 of Danish speech in the conterminous district of Slesvig, wrested from Denmark by Prussia in 1864.

Dennis, JOHN, born in London in 1657, and educated at Harrow and Cambridge, adopted literature as a profession and may be regarded as a typical Grub Street hack. He was not deficient in a sort of vulgar ability, and by composing adulatory poems on William III. and Marlborough, got a post in the Customs. Two of his plays, *Liberty Asserted* and *A Plot and No Plot*, enjoyed considerable popularity. He is chiefly remembered, however, for his critical attacks on Addison's *Cato* and Pope's *Essay on Criticism*. The first provoked an amusing pamphlet called *The Narrative of the Frenzy of Mr. John Dennis*, and the last secured him a place in *The Dunciad*. In his closing years he became blind and impoverished, dying in 1734.

Dens, PETER, born at Boom, Flanders, in 1690, took priestly orders, and held several ecclesiastical offices at Malines and Brussels. He was a successful popular teacher and a zealous systematiser of theology. Two of his more important works were *The Virtue of Religion* and *The Sacrament of Penance*, but the comprehensive text-book of morals and casuistry associated with his name and the cause of much controversy was written by several hands. He died in 1775.

Density, of any substance, means the amount of matter contained in unit-volume. The amount of matter is expressed in units of mass such as the pound or the gramme, and the unit-volume taken is the cubic foot, cubic inch, or the cubic centimetre. If the substance is not of uniform density throughout—that is to say, if different values of the density be obtained for different volumes chosen—the result obtained in any case can only be said to give an average value of the density in that chosen portion. Adopting the gramme and cubic centimetre as units, the density becomes the number of grammes per cubic centimetre. One cubic centimetre of water has one gramme mass, so that in this way we see that the density would mean the mass of the substance divided by the mass of an equal volume of water. This ratio is otherwise termed the *specific gravity* of the substance. The following is a table of densities of the more important substances, compared with water at 4° C. :—

SOLIDS.

Platinum (rolled)	22·1	Flint-Glass	3·3
Gold	19·3	Marble	2·8
Lead	11·4	Aluminium	2·7
Silver	10·5	Porcelain	2·4
Copper	8·8	Ivory	1·9
Bronze Coinage	8·7	Anthracite Coal	1·8
Brass	8·4	Sodium	1·0
Steel	7·8	Ice	0·9
Iron—Wrought	7·8	Potassium	0·9
,, Cast	7·2	Oak	0·8
Tin	7·3	Pine	0·6
Zinc	6·9	Lithium	0·6
Diamond	3·5	Cork	0·2

LIQUIDS.

Mercury	13·59	Sea-Water	1·03
Bromine	2·96	Olive Oil	0·92
Sulphuric Acid	1·84	Oil of Turpentine	0·87
Glycerine	1·26	Petroleum	0·84
Blood	1·06	Alcohol	0·79
Milk	1·03	Ether	0·71

Gases (q.v.) are usually compared with hydrogen, the lightest of known substances. [SPECIFIC GRAVITY.]

Dentalium is the genus which includes the common English "Elephant-Tusk Shell" (*D. entale*). This is a slender, curved, tubular shell, tapering gently to one end. It is about an inch or two in length. The shell is bright white, and resembles ivory in appearance; and its shape is like that of

an elephant's tusk. The animal has a distinct "radula" or armed tongue, and so it belongs to the same group of Mollusca as the Gastropoda, the class which includes the ordinary univalve "shell-fish." It was once included in this class, but it differs from it in several very important points, such as the imperfect development of the head, and the absence of heart or distinct gills; hence it is now regarded as the type of a separate class, the Scaphopoda (q.v.). The animal burrows through sand, and is confined to a range of from 10 to about 100 fathoms. Dentalium has a great range in time, as it commenced in the Carboniferous system; it is now world-wide in distribution.

Dentex, a genus of spiny-finned fishes of the family *Pristipomatidæ*, distinguished from the perches by having no teeth on the palate. There are about a dozen species from the warmer seas. *D. vulgaris*, from two to three feet long, a native of the Mediterranean, occasionally strays to the British coasts.

Dentine. [TEETH.]

Dentirostres, a lapsed sub-order of Passerine birds, distinguished by a distinct notch in the upper mandible near the tip. It included the Fly-catchers, Shrikes, Thrushes, Tits, and Warblers.

Dentistry. [TEETH.]

D'Entrecasteaux. 1. *Channel*, on the S.E. coast of Tasmania, separating Bruné Island from the mainland. It has a length of 35 miles from N. to S., and a breadth varying from 3 to 9 miles. The rivers Derwent and Huron flow into it. 2. *Islands*, a group in the Louisiade Archipelago of the S.E. extremity of New Zealand, lat. 10° S., long. 151° E. 3. *Cape*, at the S.W. extremity of Australia, between Albany and Cape Leeuwin. All the above are named after the French navigator, who lived from 1740 to 1793.

Denudation (Latin *denudo*, I strip) is the geological term for the disintegration and more especially the removal after disintegration of the surface of the ground, laying bare fresh surfaces. These processes are generally classified as *marine* and *sub-aërial*. The former, partly chemical, partly the result of waves, of shingle dashed against cliffs by waves, and of air compressed in crannies of rocks by the waves, tends to wear down everything into a *plain of marine denudation*, thus cutting horizontally; but, acting, as it does, only along the coast-line, it is estimated as doing less than a twentieth part of the work done by sub-aërial agencies. These latter include the "weathering" action of the air, the rusting produced by moisture, the solvent action of rain, the pulverisation due to the freezing of interstitial water, the flaking of rocks alternately exposed to heat and cold, the sculpturing by blown sand, the underground action of carbonated water and the "rotting" of granite, the mechanical erosion of their channels by rivers and their transport of sediment carried into them, the slower steady grinding of glaciers and the transport of material by icebergs, the loosening of rocks by roots and the burrowing of earthworms, moles, rabbits, and other animals, together with various other related agencies. Their general effect is the vertical sculpturing of the earth into *hills of denudation* and valleys, escarpments, ravines, and caves, owing to the unequal resistance of various rocks. As they act practically over the whole surface of the earth, the amount of matter removed by them to be deposited elsewhere is far greater than in marine denudation. Striking results of denudation are: the Grand Cañon (q.v.) of the Colorado, the gorge below the Falls of the Niagara (q.v.), and the removal of the chalk dome that once extended over the valley of the Weald (q.v.) between the North and South Downs.

Denver, the capital of Colorado, U.S.A., stands on the right bank of the South Platte river, in a healthy and picturesque situation, being in the midst of the gold-bearing region of the Rocky Mountains. Founded in 1858 as a mining station, this city has grown with astonishing rapidity, especially since the construction of the Pacific railway, of which it is the central point. It now contains many fine buildings, including the Government offices and other public institutions.

Deoband, a town in the district of Saharanpur, North-West Provinces, Bengal Presidency, British India. It is situated in a fertile plain between Rurki and Nuzuffernagur, within a short distance of the trunk line between Calcutta and Lahore.

Deodand, in ancient English law, a chattel which was the direct cause of a person's death and which was therefore given to God (*Deo dandum*), *i.e.* forfeited by the owner and applied to pious uses.

Deodar, a small independent state of India, in the province of Gujerat, Bombay Presidency. It has an area of about 80 square miles, and consists of groups of self-governing villages, practically under British protection, Rajputs being the chief element in the population.

Deodar (*the gift of God*), the name, of Sanscrit origin, applied to the cedar of India, *Cedrus Deodara*. A native of Nepaul and the Himalayas, extending almost into Persia. This tree grows to more than 100 feet in height, producing durable timber and useful turpentine. Its boughs droop: its leaves are longer and more three-sided than in the Lebanon cedar, and they are glaucous; whilst the cones have short stalks and fall to pieces when ripe. It was introduced as an ornament tree in 1822, and flourishes in England.

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Deodorant, a substance used to absorb noxious vapours and thus to combat foul odours—*e.g.* animal charcoal and iodoform.

Deoxidation, any process in which the whole or part of the oxygen is extracted from a body—*e.g.* the conversion of oxides to metals in smelting. This was the sole original signification of the term, but it was afterwards extended to processes in which any negative element or radical is extracted or replaced by a more positive one. Thus both the changes represented by the following equation would be called deoxidation :—

(1) $Fe_2O_3 + 3H_2 = 2Fe + 3OH_2$,
(2) $2FeCl_3 + Zn = 2FeCl_2 + ZnCl_2$,

though in the second no oxygen is present in either of the reacting substances. The term *reduction*, which is practically synonymous, is, however, more frequently employed, in both the original and extended sense, than the older word deoxidation.

Department of Control, a department created in 1870 to perform the civil administrative duties of the army. It was abolished in 1875. [COMMISSARIAT, TRANSPORT.]

Dephlegmator, an apparatus used in alcohol distilleries for freeing the spirit from water.

Dephlogisticated Air. [OXYGEN, PHLOGISTON.]

Depilatories, chemical substances employed for removing hairs from the skin.

Deposit, a general term applied in geology to all aqueous rocks, with reference sometimes to their composition, sometimes to their sources or modes of origin, or even to their age. It is applied to the chemical precipitates thrown down from solution, such as stalagmite or rock-salt, and to accumulated remains of plants or animals, such as a bed of lignite or of oyster-shells, as well as to the sediment, whether clay or sand, thrown down from mechanical suspension in water. It might even be applied to the layers of various ores and veinstones lining the two sides or "cheeks" of a vein or "lode," though we know little as to the mode of their deposition. Deposits may be laid down in the sea, in lakes, or in river-beds; as rain-wash at the foot of slopes; or even as loess (q.v.) spread out by wind over wide land areas. A deposit may be a mere film, as in the mud left on the water-meadows by a river-flood; or continuous, steady, and uniform conditions may produce marine deposits many feet in unbroken thickness. The term is not applicable to intrusive igneous rocks or to eruptive lavas; but even volcanic dust and ashes may, if they fall into water or are spread out at all uniformly over a large surface, be termed deposits.

Deposition is any affidavit, or solemn affirmation in lieu thereof; but the term is more commonly applied to a statement written down by an officer of the court, such as an examiner in the High Court, embodying the substance of the answers obtained from the deponent in the course of his examination. It is competent for either party to a suit to examine his own unwilling witness in this way, but only upon notice to the other side, who then and there may cross-examine the deponent, the side who has called him in that case re-examining him. Depositions are also taken before justices of the peace for the purpose of a criminal prosecution; and in case the deponent should die before the trial, or be too ill to attend, these depositions may be used in evidence, subject to certain legislative restrictions. This term is also used in ecclesiastical law, being the censure by which a clergyman is removed from the ministry—*i.e.* deprived of holy orders.

De Profundis (*out of the depths*), the first words of the Latin version of Psalm cxxx., part of the Roman Catholic funeral service.

Deptford, a parliamentary borough, now forming part of London, returning two members to the London County Council and one member to Parliament. It is in the counties of Kent and Surrey, which are separated by a creek, into which the Ravensbourne flows into the Thames upon the south bank. Its chief points of present interest are that it is the site of the foreign cattle market for London, and also of the central station of the Electric Light Company, who, from their magnificent installations at Deptford, profess to be able to supply London with electric light when the demand for it shall become general. An arsenal was founded here by Henry VIII., and there was an extensive Government dockyard, which only ceased to exist in 1869. There are many points of historical interest connected with Deptford. The old Elizabethan naval heroes were familiar figures in its streets. Here Kit Marlowe was killed; here Peter the Great

served his apprenticeship in the ship-building art; and it was at the neighbouring Saye's Court that John Evelyn had reason to bewail the depredation that the Czar committed upon the well-trimmed hedges by employing a man to wheel him through them on a barrow. Of the two ancient parishes of St. Nicholas and St. Paul, the former is in Kent and the latter in Kent and Surrey. There is still a royal victualling yard in Deptford, besides a good deal of industry in pottery and the manufacture of chemicals.

De Quincey, THOMAS (1785–1859), a noted English man of letters, was the son of a Manchester merchant who called himself Quincey, the son afterwards assuming, or resuming, the prefix "De," and was born at Greenhay. The death of his father in 1793 gave him part-claim to a fortune of £30,000. He was educated at Manchester grammar school and at Bath, whence he ran away; and his wanderings in Wales, his experience of the tidal bore in the valley of the Wye, his hardships in London, where he made the acquaintance of "Poor Ann," whom he has immortalised, form a not uninteresting part of his autobiography in the *Confessions of an Opium-Eater*. In 1803 he went to Oxford, and it was here that the pangs of gastrodynia, or stomachic neuralgia, drove him to the use of opium, to which he became an habitual slave. It seems, however, to have been justifiable for medical reasons in his case. From Oxford—through the influence of Coleridge, whom he met at Bristol—he went to Grasmere, and associated with Wordsworth and Southey. From 1803 to 1828 he spent his time chiefly here or in London, and was a prolific writer, magazine articles being his special forte. He wrote for, among others, *The London Magazine*, *Knight's Quarterly*, and *Blackwood's*. From 1828 to 1840 he lived in Edinburgh, and then at Lasswade, near Edinburgh. He was married, and had many children; but he was no man of business, and his eccentricities were marked. To vast general knowledge, and a quaintly precise though involved style, he united great originality in choice and treatment of subjects. His *Confessions*, *Murder as a Fine Art*, *The Casuistry of Roman Meals*, are good specimens of his manner. He made contributions of some value to political economy.

Derajat, a district of the Punjab, lying in the valley of the Indus, constituting a commissionership, and containing Dera Ghazi Khan, Dera Ismael Khan, and Bannu. It is a fertile, well-watered tract of 17,681 square miles, and contains many towns and villages. Most of its population are Mohammedans.

Derbend, a fortified Russian town, on the western shore of the Caspian, and capital of the Russian Government of Daghestan. The chief industries are the manufacture of woollen stuffs, copper and iron ware, and rose-water, and there is a considerable trade in saffron, which is grown in the neighbourhood. The town, which was Persian, is said to have been founded by Alexander the Great and fortified by Chosroes. The Arabs took it in the seventh century, and the Caliph Haroun Alraschid is said to have lived there. Among the many ancient ruins of the neighbourhood is an ancient wall said to have been built as a protection against barbarian incursions. The town became Russian in 1722, and again finally in 1795.

Derby (Saxon name *Northworthige*), a municipal and parliamentary borough and capital of the county of Derby, upon the Derwent, which is crossed by a bridge of three arches. The town is very ancient, being almost the site of the old Roman settlement of Derventiæ or Derventio, which was at Little Chester on the other side of the river. The modern town, situated in a wide fertile valley open to the south, is well and regularly built, and has some fine public buildings, among them the county hall, a school of art and infirmary, and a free library and museum. The three principal churches are All Saints, St. Alkmund, and St. Werburgh, at the last of which Dr. Johnson was married. Derby is a county borough and sends two members to Parliament. The chief industries are silk, cotton, paper, and porcelain manufactures and the preparation of articles in Derbyshire spar. The manufacture of porcelain owed its origin to Mr. Duesbury in 1750, and crown Derby china is well known. John Lombe established the first silk factory in 1714. There is a large carriage factory here, and the Midland Railway has extensive works employing a large number of hands. The town is well served by railways. Richardson the novelist was born here.

Derby, EDWARD GEOFFREY SMITH STANLEY, FOURTEENTH EARL OF, was born at Knowsley Park, Lancashire, in 1799. He was educated at Eton and at Christ Church, Oxford, and in 1819 gained the Chancellor's prize for his Latin poem on *Syracuse*. In 1820 he was returned to Parliament for Stockbridge in the Whig interest, but he did not deliver his maiden speech until 1824. He then quickly made his mark, however, and was regarded as a distinct accession to the Liberal ranks. In 1826 he changed his seat from Stockbridge to Preston, where his family wielded great influence. In the following year, in conjunction with other prominent Whigs, Mr. Stanley effected a coalition with Canning, and became Under-Secretary for the Colonies. The coalition was dissolved on the death of Canning. On the formation of Lord Grey's Ministry in 1830 Mr. Stanley was appointed Chief Secretary for Ireland. Going before his constituents for re-election, he was defeated by "Orator" Hunt, but a seat was found for him at Windsor. In 1832 he became member for North Lancashire, which constituency he continued to represent until his elevation to the peerage. In consequence of the Repeal agitation in Ireland and the alarming and fatal riots throughout the country, the Chief Secretary was called upon to introduce a stringent Coercion Bill, which he successfully carried through the House of Commons against the fierce opposition of O'Connell and his friends. Mr. Stanley's tenure of the Chief Secretaryship was marked by the passage of many valuable Irish measures. In 1833 he became Secretary for the

Colonies. Mr. Stanley seceded from the Whigs in 1834, when it was proposed to appropriate the surplus revenues of the Irish Church to educational purposes. He was appointed Colonial Secretary in the Conservative Administration of 1841, and held that appointment for four years. In 1844 he was called to the Upper House in his father's barony of Stanley of Bickerstaffe, having for ten years preceding borne the courtesy title of Lord Stanley. When Sir Robert Peel proposed the repeal of the Corn Laws, he retired from the Cabinet, and in 1846 took the lead of the Protectionists. Succeeding to the earldom in 1851 on the death of his father, in February, 1852, he became the head of a Conservative Government, but the Ministry was defeated in the ensuing December, and resigned office. Lord Derby again became Premier in February, 1858, but, being defeated on the question of Parliamentary Reform, he appealed to the country. When the new House of Commons met in June, 1859, a vote of want of confidence was carried, and the Government resigned. In 1866 Lord Derby became Prime Minister for the third and last time. In conjunction with Mr. Disraeli he passed the Reform Act of 1867, which he himself described as "a leap in the dark." He resigned the Premiership in 1868, and his last speech in Parliament was made, in 1869, in opposition to the Irish Church Disestablishment Bill. He died at Knowsley in 1869. Lord Derby was one of the first of parliamentary speakers, and was styled "the Rupert of debate," in consequence of the fiery nature of his eloquence and his powers of invective. He was also an excellent scholar, and published a blank-verse translation of Homer's *Iliad*.

Derby, Edward Henry Smith Stanley, Earl of, born 1826, is the fifteenth earl, being the son of the well-known Conservative Prime Minister and statesman. The present earl was educated at Rugby and at Trinity College, Cambridge, where he graduated in honours. In 1848 he entered the House of Commons as member for King's Lynn, and in 1852 he was appointed Under-Secretary in the Foreign Office. In 1858–59 he was Secretary for India in his father's Government at the epoch of the transfer of the East India Company's jurisdiction to the Crown. In 1866–68 he was Foreign Secretary in the Derby-Disraeli Government, and in 1869 succeeded to the earldom upon the death of his father. In 1874 he was again Foreign Secretary in the Conservative Government, but resigned in 1878 over the question of calling out the reserves and occupying Cyprus. In 1880 he joined the Liberal ranks, and was Colonial Secretary 1882–85. In 1886 he departed from Mr. Gladstone upon the question of Irish Home Rule. He has been Lord Rector of Glasgow and Edinburgh Universities.

Derby Day, the last Wednesday in May or (occasionally) the first in June, on which the "Derby Stakes" for three-year-olds are run for at the summer meeting on Epsom Downs. They were instituted in 1780, and are called after the then Earl of Derby. The journey there and back from London by road, the subject of many caricatures, has been shorn of much of its former glory (and disorder) by increased railway facilities. The course is $1\frac{1}{2}$ miles. The quickest time hitherto has been 2 min. 43 sec (1888). Colts now carry 9st.; fillies 8st. 9lbs.

Derbyshire, a central county of England, 55 miles in length, with a breadth varying from 15 to 30 miles, containing 658,624 acres, or 1,029 square miles, and divided for political purposes into seven divisions, returning each one member to Parliament. Its name, Deorby, or Deoraby, shows that it was once forest-land occupied by wild animals. The county falls geologically into three divisions, that of the north-west, which is bleak and irregular, and forms part of the Pennine range, which, having here the general name of "The Peak," and reaching a height of 2,000 feet, is the watershed of central England; that of the east and north-east, which belongs to the English coal-fields; and that of the south, which is in the Trent Valley, and has a rich red soil proceeding from the sandstone. The principal rivers, which cut their picturesque passage through the limestone, are the Derwent, Dove, Erewash, Rother, and the Trent. About five-sixths of the county is arable or pasture-land, producing good crops of oats and turnips, and containing fine dairy farms. George Eliot has given us a good picture of Derbyshire farms and farmers in Adam Bede. Among the minerals are coal, iron ore, lead, gypsum, zinc, and fluor spar. Besides its agriculture, the county is noted for silk, cotton, and lace manufactures, for the making of machinery and agricultural implements, and for its breweries. There are many remains of antiquity, such as tumuli, and a stone circle. Formerly part of the kingdom of Mercia, and ruled by, among others, the Lady of Mercia, Ethelfreda, daughter of Alfred the Great, Derby became a Danish centre. Later in history Derby was the farthest point south reached by Charles Edward in his expedition into England. Brindley the engineer, Chantrey the sculptor, and Arkwright were all Derbyshire men. Among its towns Chesterfield is notable for its manufacturing importance, and its curious church-spire is well-known to most travellers to the north, and the waters of Buxton and Matlock are widely famed. Haddon Hall and Chatsworth are also of great interest.

Derelict, anything cast away or abandoned, with the intention of quitting the ownership thereof. Goods thrown out of a vessel to lighten same in time of distress are not derelict for the want of intention. The term is also applied to land left dry by the sea shrinking back below the usual high-water mark, or by a river changing its bed.

Dermestidæ, a family of beetles of which the eggs are usually deposited in animal matter; the larvæ, when hatched, burrow through this and soon secure its putrefaction. Thus the larvæ of a single brood of the Bacon Beetle (*Dermestes lardarius*, Linn.) will destroy a whole ham.

Dermosclerites, the spicules found in the hard dermal layer of Alcyonaria.

Dervish (from a Persian word = *doormat, i.e.* beggars at the door), a class of Mohammedan

begging monks, who are bound to poverty, chastity, and obedience. Some are in monasteries, others scattered among the people. They somewhat resemble the fakirs of India. At their public services, the highest order, the dancers, whirl round and round, shouting incessantly, "There is no God but God," while the "howlers," a less exalted class, sway themselves backwards and forwards, shouting the same sentence. These services are one of the sights of Cairo. The term is also applied to the fanatical Soudanese troops of the Mahdi, or to those of them who have been a pilgrimage to Mecca.

Derwent, the name of four English rivers:—(1) That of Derbyshire, rising in the Peak, and flowing between 50 and 60 miles into the Trent; (2) in Yorkshire, (3) in Durham, and (4) in Cumberland, draining Lakes Bassenthwaite and Derwentwater, and falling into the Irish Sea at Workington. There is also a Derwent in Tasmania with a course of over 100 miles, and navigable by a large estuary to Hobart.

Derwentwater, a lake of Cumberland, called also Keswick Lake, in the vale of Keswick, having a length of three miles from Skiddaw in the north to the hills of Borrowdale in the south, and an average breadth of $1\frac{1}{2}$ miles. There are many islands, and fish are abundant, especially perch. In the N.E. is the cascade of Lodore, commemorated by Southey.

Derwentwater, JAMES RADCLIFFE, EARL OF, an amiable but unfortunate Jacobite partisan, who was born in London in 1689, being an illegitimate grandson of Charles II. He took a rash part in the premature rising of 1715, and, starting early in October of that year, he was forced to surrender within five weeks. In spite of great efforts made to obtain his pardon, he was executed on Tower Hill in February, 1716, and his estates were confiscated. They formed, in 1735, the endowment of the Greenwich Naval Hospital.

Desaix de Veygoux, LOUIS CHARLES ANTOINE (1768–1800), a French general, born of a noble family, near the village of Ayat in Auvergne. He entered the regiment of Brittany as a sub-lieutenant, and did good service under Pichegru in 1792. Two years later he distinguished himself in the army of the Rhine under Moreau, and held out bravely for some time in the fortress of Kehl. In 1797 he was with Bonaparte in Egypt, and did much towards the subjugation of Upper Egypt, penetrating as far as the first Cataract. He was much respected by the natives, who called him the Just Sultan. In Italy he commanded the Corps of Reserve, and decided the battle of Marengo by his opportune appearance and brilliant charge. But he lost his life, being mortally wounded by a cannon shot. His integrity and freedom from self-seeking caused him to be universally beloved, and Napoleon described him as being "un caractère tout-à-fait antique."

Desbarres, JOSEPH FREDERICK WALLET (1722–1824), an English soldier and hydrographer, descended from a Huguenot family settled in England. Educated at Woolwich Academy, he joined the 60th Regiment, and went with it to America. He was first employed against the Indians, whom he subdued. He was present at the siege of Quebec in the capacity of aide-de-camp to General Wolfe. After being entrusted with the fortification of Quebec, he undertook the survey of the river St. Lawrence. He then took part in an expedition to Newfoundland, and then made researches in Nova Scotia. At the outbreak of the War of Independence operations were embarrassed by the want of accurate maps of the American coast, and in 1777 Desbarres revised the existing maps, issuing an edition called *The Atlantic Neptune*. In 1784 he became governor of Cape Breton Island, and in 1804 he was made governor of Prince Edward Island, being then 84 years old. He died at Halifax at the age of 102. From him Captain Cook learned navigation.

Descartes, RENÉ (1596–1650), a French philosopher, who, from his influence upon later thought, has been called the father of modern philosophy. He was born at La Haye in Touraine, and was educated at the Jesuit college of La Flèche, where he displayed much talent. He entered the army, serving in Holland and Bavaria. In 1621 he left the army, and then after a period of travelling he settled in Holland, where he gave himself up to the study of philosophy. Finding the scholastic philosophy unsatisfactory in method and barren of results, he set about the discovery of truth. His first step was to divest himself of all preconceived ideas, and to take reason only as the test of truth. He concluded that the one proof of existence and the first established fact was consciousness of self. Hence his famous dictum, "*Cogito ergo sum*," which occurs in his *Meditationes de Primâ Philosophiâ*. The soul, not the body, is the important part of man, not being limited by extension in space, but being free and immaterial. Not every perception of the soul is perfect, but this imperfect perception leads to and implies the idea of a perfect being, a supreme intelligence whence proceeds all knowledge of truth. The essential nature of the soul is thought, that of the body, extension. Animal bodies are automata, worked by "animal spirits," themselves material, located in the nerves and set in motion by the action of external objects. Descartes saved free-will by supposing that in man, the soul residing in the pineal gland could change the direction of these spirits. [MALEBRANCHE.] Descartes maintained the doctrine of innate ideas. In physics Descartes studied much, and his theory of "vortices," or violent but regular commotions of the ether which account for the movements of the planets, was widely prevalent until upset by Newton's theory of gravity. In mathematics he made valuable discoveries, and was the chief founder of the science of analytical geometry. He also developed the theory of equations. It is noticeable that he never broke with Catholicism. In 1647 he was granted a pension by the French Court, and in 1649 he was invited by Christina, Queen of Sweden, to Stockholm to give her instruction, but the rigour of the northern climate soon killed him.

Descent (from the Norman-French *discent*) is the rule of law, pursuant to which, on the demise of the owner of an estate of inheritance (*i.e.* a fee-simple or freehold estate), he having made no disposition thereof by will or otherwise, it descends to his heir. Inheritance is a somewhat analogous word to descent, it signifying what may be taken by descent. The law with regard to this subject, and which regulates all descents taking place after the 1st of January, 1834, is prescribed by the Statute 3 and 4 William IV., c. 106. It has been well said that estates descend from ancestor to heir as the blood trickles. Property is acquired *in two ways only*, viz. by purchase or descent; if acquired by will, gift, grant, devise, or otherwise than by descent, it is in legal language acquired by purchase. Descent or hereditary succession is the title by which anyone acquires an estate in land as heir-at-law of a person deceased. In the lifetime of that person there can be no descent, and therefore no heir, though there may be an heir-apparent or an heir-presumptive. An heir-apparent is one who must be the heir if he survive to inherit. An heir-presumptive is one whose inheritance may be defeated by the birth of a nearer heir.

The following are the canons which at present regulate the descent of lands:—

(1) The inheritance descends to the lineal descendants of the purchaser *in infinitum* (see above remarks as to the meaning of the word "Purchaser").

(2) And to the male issue in preference to females.

(3) And to the eldest male issue in exclusion of the others [PRIMOGENITURE], but if there are no male issue, then to female issue altogether. [COPARCENERS.]

(4) Lineal descendants *in infinitum* are to represent their ancestor. [REPRESENTATION.]

(5) Failing lineal descendants of the purchaser, the inheritance is to go to the nearest lineal ancestor, the father succeeding before the brother or sister of the purchaser, and every more remote ancestor succeeding before his issue other than any less remote ancestor or ancestors and his or their issue.

(6) In the application of the fifth canon the succession is to be according to the following order:—

(*a*) The father and all male paternal ancestors and their descendants *in infinitum*.

(*b*) All the female paternal ancestors and their heirs.

(*c*) The mother and all male maternal ancestors and her and their descendants *in infinitum*.

(*d*) All the female maternal ancestors and their heirs.

(7) The half blood of the purchaser shall inherit:—

(*a*) Where the common ancestor is a male next after a kinsman in the same degree of the whole blood and the issue of such kinsman *in infinitum*, and

(*b*) Where the common ancestor is a female next after that female.

(8) In the application of the sixth canon:—

(*a*) In the admission of female paternal ancestors the mother of the more remote male paternal ancestor and her heirs are to be preferred to the mother of the less remote and her heirs.

(*b*) In the admission of female maternal ancestors the mother of the more remote male maternal ancestor and her heirs are to be preferred to the mother of the less remote one and her heirs.

(9) Failing the discovery of an heir after the application of all the first eight canons, the land is to descend to the heir of the person last entitled, although he was not the purchaser thereof; and such heirs will, of course, have to be ascertained by the renewed application of the first eight canons, starting only from a different point of departure or propositus.

Estate Tail. The descent of an entailed estate or, in legal language, an estate tail, which is an estate limited to a person and the heirs of his body, follows the first four canons, unless it is barred, or unless it is limited to special heirs or to males or females, in which case the canons govern its descent, so far as they are applicable. [ESTATE TAIL.]

Customary Descent, such as Gavelkind and Borough English, are regulated by the customs of particular districts, and are exceptions to the above canons of descent so far as the respective peculiarities of those customs are concerned. [COMMON LAW (Particular or Special Customs), BOROUGH ENGLISH, GAVELKIND.]

Descent, Theory of [DARWINISM, DEVELOPMENT, EVOLUTION.]

Deschamps, EUSTACHE (1320 *to circa* 1400), a French poet, as to whose name there is some doubt, since *Deschamps* was an epithet denoting his origin, and the name *Morel*, which was also applied to him, is thought to have had its origin in his swarthy complexion. After studying law, philosophy, and astronomy at Orleans, he travelled in Europe, Asia, and what was then known of Africa. He took part in the war with England, and was so indignant at having his property overrun and plundered by the English that he lost no opportunity of satirising the English nation in his poetry. He married, but his married life seems not to have been a success, since up to the age of 90 woman and marriage were to him favourite objects of satire. His works were numerous, and as he created the ballad, or at least laid down rules for its composition, he may be fairly considered to have a better claim to the title of Father of French poetry than Charles d'Orleans, upon whom it is generally bestowed.

Desertion. 1. The crime of abandoning the naval or military service without licence. 2. The term also legally signifies the abandonment of a wife, which is a matrimonial offence, as is also the case where the wife leaves her husband, and for which a sentence of judicial separation may be obtained if the desertion has been for two years and upwards without cause; and by the Married Women's (maintenance in case of desertion) Act, 1886, a deserted

wife may obtain an order from justices of the peace for payment by her husband of a weekly sum, according to his means, not exceeding £2. 3. The abandonment or desertion of young children has also been provided against by an Act of the present reign, by which anyone unlawfully abandoning or exposing any child under two years of age in such manner that its life or health is endangered or likely to be permanently injured shall be guilty of misdemeanor and punishable by penal servitude for five years, or imprisonment, with or without hard labour, not exceeding two years; and for better protection of infant life, a later statute makes it unlawful for anyone to retain or receive for hire or reward more than one infant (or, in case of twins, more than two) under the age of one year for the purpose of nursing or maintenance, apart from their parents, for longer than 24 hours, except in some duly registered house; and in case of proved serious neglect of these provisions, or that the person registered is incapable of supplying the infants with proper food, or that the house has become unfit for the reception of infants, the house may be struck out of the register, and any offence under that Act may be prosecuted summarily, and on conviction the punishment may be imprisonment for not more than six months with or without hard labour, or a penalty not exceeding £5.

Desiccation, the process or processes by which a substance, which may be either solid, liquid, or gaseous, is freed from accompanying moisture. For solids, heat alone is the most common mode of accomplishing this, steam or air ovens being generally employed. The action may also be accelerated by the passage of a current of hot dry air over the solid. In cases where heating is inadmissible, the drying may be effected by placing the substance in an exhausted vessel containing also a quantity of some desiccator. Liquids are generally allowed to stand over, or shaken with, some substance which combines readily with water, but does not act upon the liquid in question. The chief of such substances—*desiccants* or *desiccators*—in ordinary use are metallic sodium, phosphorus pentoxide (P_2O_5), sulphuric acid, calcium chloride, and quicklime. Gases are usually dried by passing through tubes containing one or other of the above *desiccants*. The commonest forms of such *drying-tubes* are U-tubes containing pieces of pumice saturated with sulphuric acid, or loosely filled with calcium chloride.

Desman. [Musk Rat.]

Desmids, a group of chlorospermous algæ, in many respects resembling the brownish and siliceous diatoms (q.v.). They occur in pools and streams, and consist typically of loosely-connected chains of unicellular joints, or individuals, increasing, as in diatoms, by each pair of joints producing two new half-joints between them, and so on, each joint consisting of an older and a newer half. The chlorophyll which they contain is often confined to stellate or banded portions of the protoplasm. Conjugation takes place in many forms, either on contact or by the putting out of tubes, and results in the formation of a large resting-spore. Desmids have no known economic application.

Desmoines, a town of the U.S., capital of Polk county, and of the state of Iowa, on a river of the same name, 350 miles W. of Chicago. The town contains some good public buildings, and possesses extensive manufactures. There are coal mines in the neighbourhood. Desmoines River rises in a group of lakes in the S.W. of Minnesota, and flows S.E. for 300 miles into the Mississippi, four miles below Keokuk. It is the largest river of Iowa, and for 20 miles above the junction it forms the frontier between Iowa and Missouri.

Desmotropy, Desmotropism. Certain chemical compounds appear in different conditions to possess different *constitutions*. [Chemistry.] Thus the body in most of its reactions appears to have a certain constitution, the *stabile* form; but other reactions can only, or best, be explained on the assumption of a different constitution, the *labile* form. To this remarkable phenomenon Victor Meyer gave the name *desmotropy*. It is more frequently known as *tautomerism*.

Desmoulins, Benoît Camille (1760–1794), a pamphleteer, journalist, and orator of the French Revolutionary period. He was born at Guise in the province of Picardy, the province that produced Peter the Hermit, Calvin, the Guises, and St. Simon. He obtained an exhibition at the Collège of Louis le Grand, and here he had Robespierre as a fellow-exhibitioner. A study of the history of Athens and of Rome gave them an admiration of republican institutions, and the contrast of what they read with what they saw around them in the corrupt French Court confirmed them in their views. Desmoulins studied law and became an advocate, but a stammer prevented him from practising in court and he turned his energies to writing. His work, *France Libre*, has been called "le chant de l'alouette gauloise saluant l'Aurore de la liberté." He helped found the club of Cordeliers, and he it was who in 1789 fired the people with the enthusiasm that culminated two days later in the taking of the Bastile. Although he voted for the king's death he was an advocate of moderation, and with Danton opposed the reign of terror. Although he had been a pioneer of the revolution, his services to the cause did not prevent his being arrested, tried, and executed, though he pleaded his services on the way to execution. He died at the age of 33. His wife Lucile made great efforts to save him, but she herself was beheaded ten days later.

De Soto, Hernando (1496–1542), a Spanish explorer, who went to the New World under Davila and Pizarro, and had a great share in the conquest of Peru. In 1536 he took part in an expedition to Florida, and penetrated to the Mississippi. He, however, contracted a fever and died there.

Des Perriers, Bonaventure (*circa* 1499–1544), a French poet and philosopher, born at Arnay-le-Duc in Burgundy. He was educated in a monastery, and seems there to have imbibed a hatred of monks and of religion generally. He obtained a post in the household of Margaret of Valois, and is

thought to have probably had a hand in the production of the *Heptameron*. At any rate in the witty Court he was in his element, and his scepticism found there a ready welcome. The King of Navarre, however, took a dislike to him, from what cause is not exactly known, and expelled him from the Court. His satirical *Cymbalum Mundi* was condemned by the authorities of the Sorbonne, and, with no less heartiness, by Calvin. A French critic has said that the most prominent men of the early part of the 16th century were Rabelais, Morot (Deschamps), and Des Perriers, and that none of them was inferior to the others.

Dessalines, JEAN JACQUES (*circa* 1760–1806), an Emperor of Hayti, was born in Africa, and till 1791 was a slave. He was set free in 1794 with the other slaves in St. Domingo, and had great influence with his fellow-insurgents through his skill in war, his courage, and his unscrupulousness. After the deportation of his chief, Toussaint l'Ouverture, and the evacuation in 1803 by the French Government, he was made governor-general for life with dictatorial power, and in 1804 he made himself emperor. His savage disposition and oppressive habits made him hated, and both troops and people conspired against him. He was killed by a soldier who succeeded him as emperor. Michael Scott, in *Tom Cringle's Log*, gives a good idea of the condition of Hayti at this period or a little later.

Dessau, a German town, capital of the Duchy of Anhalt, in a beautiful valley upon the left bank of the Mulde. It is well built and has fine squares and handsome buildings, among which is the ducal palace with a good picture-gallery and an interesting collection of antiquities. There are manufactures of woollens, woollen yarn, carpets, machinery, and tobacco.

D'Estrées, JEAN, Admiral of France, son of the marshal François Duc D'Estrées, who died in 1670, was born in 1624 at Paris. He saw much service in the West Indies, where he retook Cayenne from the Dutch, and in the Mediterranean, where he bombarded Tripoli. He died in 1707. It was this commander who, in 1672, at the battle of Solebay, left James, Duke of York, to bear the brunt of the action with the Dutch, and so rendered the engagement indecisive.

Desuetude, a Scottish law term signifying that long usage with public consent has practically effected the revocation of a previous legal enactment. The word has no signification of this kind in English law, where a statute must be repealed or modified (by statute subsequently passed) to be rendered inoperative. There are, however, several statutes that have become practically obsolete in England.

Determinants, in *Algebra*, the name given to a modern extension in notation, of much value in obtaining solutions of sets of unknown quantities, and in expressing certain symmetrical expressions compactly.

Detroit (Fr. *détroit*, a strait), so-called from its situation on the strait which joins Lake St. Clair and Lake Erie, is a port, and the largest city of Michigan. The site rises gradually from the waterside, and the town is generally well-built and has some fine public buildings. It is in a flourishing condition, being centrally placed for trade, and being also in the direct track of Western emigration. The harbour is one of the finest in the United States, and is deep enough to receive the largest vessels. There are many industries, the chief of which are saw-mills, flour-mills, ship- and boat-building, foundries, tanneries, blast-furnaces, pork-curing, tobacco and cigar making, breweries, and locomotive-building. The French formed a settlement here in 1701. The DETROIT RIVER or Strait of St. Clair is 28 miles long, ¾ of a mile wide opposite Detroit, increasing in width lower down, and is navigable for the largest vessels. A tunnel has been projected beneath the river at Detroit to connect the American and Canadian sides, thus giving more direct railway communication between Quebec, Toronto, and Chicago and the Far West than exists *viâ* Sarnia and Port Huron.

Dettingen, a small German town in Bavaria, on the right bank of the Main, chiefly memorable for the fact that here a King of England last made his appearance on the battle-field in the person of George II., who, in 1743, with an army of English, Hanoverians, and Austrians, opposed and beat a French army under Marshal the Duc de Noailles.

Deucalion, the Noah of classical mythology, who, when Zeus drowned the world, entered into a ship, and after floating for many days landed on Mount Parnassus. He was accompanied by his wife Pyrrha, and the pair being bidden by Themis to re-people the world by casting behind them the bones of their mother, solved the riddle by casting stones from mother earth. Those cast by Deucalion became men, those by Pyrrha women. Deucalion was son of Prometheus, and father of Hellen, the founder of the Hellenic race.

Deuteronomy (Gk. *the second law*), the fifth book of the Pentateuch, containing three addresses of Moses to Israel before the passage of Jordan, with certain of his last acts and words. It is hardly, as the title implies, a repetition of the law, which is more elaborately given in Leviticus. Some Hebrew scholars (*e.g.* Gesenius and Ewald) have regarded it as later than the rest of the Pentateuch; others (as Wellhausen) identify it with the "Book of the Law" found by Hilkiah (2 Kings xxii.), and suppose it to have been composed shortly before that date. Neither hypothesis is precisely verifiable. According to the supporters of the latter, the blessing of Moses (Deut. xxxiii.) is much earlier than the rest.

Deutsch, EMMANUEL, the celebrated Hebrew scholar, was born in 1829 at Neisse. He became an assistant in the British Museum in 1855. His researches in Hebrew literature, his treatise on the *Talmud*, gave him a high place among scholars of the day. He died at Alexandria in 1873.

Deutzia, a favourite genus of shrubby plants of

varied size belonging to the order *Philadelphcæ* (related to the saxifrages). The clustered flowers have a campanulate calyx of five sepals; five petals, generally white, beneath an epigynous disc; ten stamens with flat filaments; and an inferior three- to four-chambered ovary, with distinct styles. The fruit is capsular. The simple leaves are interesting microscopically from their stellate hairs, which are so rigid that the leaves of *D. scabra* are used in Japan for polishing purposes. Several species are commonly cultivated.

Devanagari (*i.e. divine writing*), the Hindu name of the Sanscrit alphabet, which is now commonly believed to be of Phœnician origin. The oldest extant forms are those occurring on the rock inscriptions of King Asoka about the third century B.C. Since that time the letters have undergone considerable change, still further removing them from their Phœnician prototype, from which the system also differs in that it is written like the European alphabet of the same origin, from left to right, whereas the Phœnician ran from right to left. The complete alphabet consists of 50 letters (16 vowels and 34 consonants), besides a large number of double and even treble forms, somewhat after the manner of our monograms, which, however, are not now much used in printed Sanscrit works. But the vowels, when following the consonants, are combined with them, losing their independent forms, and giving rise to a syllabic system, in which each consonant, combining with the 16 vowels, forms 16 syllables, thus: *ka*, *kā*, *ki*, *kī*, *ku*, *kū*, etc. In the alphabet the vowels, including two diphthongs, are placed first in a group by themselves. Then follow the consonants in groups of five, arranged on strictly phonetic principles; gutturals, dentals, labials, etc., by themselves, each surd followed by its sonant, and both by their aspirates and corresponding nasals. Thus the surd guttural *k* yields the series *ka*, *kha*, *ga*, *gha*, *nga*; the dental *t* in the same order yields the series *ta*, *t'ha*, *da*, *d'ha*, *nă*; and so on. In this respect Devanagari differs altogether from the European alphabets, which still roughly retain the inorganic order of the Cadmean system, though the Indian and Western agree both in writing from left to right (Greek and Italic originally ran from right to left, and then both ways), and in developing true vowels from the Phœnician breathings. With the development of Hindu culture, the Hindu writing system has spread not only throughout India and Ceylon, but also to Tibet, Indo-China, the Eastern Archipelago, and the Philippine Islands. Thus Devanagari, in endlessly modified form, is the parent of all the numerous modern Indian alphabets, both neo-Sanscritic and Dravidian, as well as of the Tibetan, Burmese, Siamese, and Khmer (Cambojan) in Farther India, of the Rejang, Batta and others in Sumatra, of the Kavi and Javanese in Java, of the Bugi and Mangkassara in Celêbes, of the Tagala and Bisaya in the Philippines. Doubtless, also, to the same source will ultimately be traced the still undeciphered writings of Easter Island and some other Polynesian islands. Devanagari never penetrated north-westwards into Irania, which was already supplied with scripts derived either from Phœnician or from the Cuneiform systems. For the same reason it was excluded from Central Asia, Mongolia, Manchuria, China, Corea, and Japan, where other cultures prevailed.

Development, the spontaneous production of progressive diversity, is a universal phenomenon, dependent on what Mr. Herbert Spencer has termed the instability of the homogeneous. The influence of surrounding forces, varying in their co-operation or opposition, and the mere summation of effects from the repeated action of the same causes, tend to modify things, to make them unlike what went before. This process, acting under natural law, is development. It has been suggested that the substances we know as elements may have developed from some one primitive form of matter. "While the matter composing the Solar system has been assuming a denser form, it has changed from unity to variety of distribution. Solidification of the Earth has been accompanied by a progress from comparative uniformity to extreme multiformity. In the course of its advance from a germ to a mass of relatively great bulk, every plant and animal also advances from simplicity to complexity. The increase of a society in numbers and consolidation has for its concomitant an increased heterogeneity both of its political and its industrial organisation. And the like holds of all super-organic products—Language, Science, Art, and Literature." (Spencer.) Among the laws of this development we can only here allude to a few. Carl von Baer's principle of the parallelism of *ontogeny*, or the course of development of the individual, with *phylogeny*, or the course of development in the race, gave importance to the study of embryology as throwing light on the succession of organic forms in time. Darwin and Wallace showed the tendency of organisms to vary indefinitely from their original type; and Wallace has shown that individual variations may be of considerable extent. Cope's law of acceleration of development indicates the inheritance of characters arising by "spontaneous" variation at slightly earlier stages in the development of the individual in each successive generation. Döhrn, Lankester, and others have emphasised the fact that degeneration (q.v.), and even atavism or reversion, may and do occur as concomitants of a system of increasing diversity which may more often result in advance. The facts of variations occurring in several directions from one stock, and of the whole series having, as we often find among fossil forms, become extinct, militate against the idea of a necessary innate perfectibility in all organisms, such as was maintained by Lamarck and Nägeli. The evidence of palæontology (q.v.), though necessarily fragmentary, points clearly to a gradual development of organic life in its now infinite variety and in its marked geographical provinces. For development of the embryo, *see* EMBRYOLOGY, MESOBLAST.

Deventer, an ancient town of Holland, in the province of Overijssel, 8 miles north of Zutphen, at the junction of the Schipbeek and the Ijssel. It has played a memorable part in history, and was at

one period an important Hanse town. The church of St. Lievin is noted for its Roman crypt. Erasmus went to school in this town. The principal productions are carpets, cast-iron goods, printed cottons, hosiery, and a kind of cake called Denterkoek. A good deal of butter is exported.

Deviation. A mariner's compass should lie in the magnetic meridian, but neighbouring masses of iron and steel will cause some deviation from this position. It is often difficult to avoid this, though the consequences of an unknown deviation of the needle may be very serious. If possible, the compass should be placed far from all such magnetic matter as steel or iron ; and if this cannot be done, suitable bars should be so adjusted as to neutralise their deviating influence.

In *Optics*, deviation means the change in direction of rays or waves of light by reflection or refraction. If, for example, light strikes a mirror at an angle of 45°, a deviation of 90° is produced by the reflecting surface. By reason of the deviation of light in passing obliquely through the atmosphere we are sometimes able to see the moon before it is actually above the horizon.

Devil Fish, a popular name for Rays of the family Myliobatidæ, generally of large size, from temperate and tropical seas. Those of the genera Cephaloptera and Ceratoptera sometimes attack and capsize boats. The name is also applied to the Angler and the Octopus (both which see). [Ray.]

Devil's Bridge, a name often bestowed upon bridges in difficult positions and hardly accessible places. The most noted is that over the Reuss, in Switzerland, on the road over the St. Gothard, between Germany and Italy. It is of stone, and extends for 75 feet from mountain to mountain, and takes the place of an older bridge situated higher up. There is also a noted Devil's Bridge in Wales.

Devil's Coach Horse (*Ocypus oleus*, Linn.) is one of the largest and best known of the *Staphylinidæ*, or "Rove Beetles." It is very common in English lanes and fields, and can be readily recognised by the defiant attitude, with head and tail thrown well up, which it assumes when alarmed. It can inflict rather a sharp bite.

Devizes (from Roman *Divisas*, the border spot), a municipal borough, market, and assize town of Wiltshire, nearly in the centre of the county, of which it is the second capital, and situated upon the old Bath and London road, at an elevation of 500 feet upon the flat top of a hill which forms a tableland to the W., and having from this circumstance a bracing air. The town is two miles long and one mile broad, and its streets, though irregular, are well paved. The Market Cross has an inscription commemorating the death of one Ruth Pierce, who was a modern Sapphira both in habits and ending. The chief industries are agriculture, the manufacture of implements and engines, and malting. The Kennet and Avon Canal passes Devizes, and surmounts the hill by the aid of twenty-nine locks. There was an ancient castle, from which in the 12th century the Empress Maud escaped in a coffin. There was an engagement here in 1643 between the Parliamentary general Waller and the Royalists under Lord Wilmot, and Cromwell had the castle dismantled. On Roundway Down in the neighbourhood is an ancient earthwork. Sir Thomas Lawrence, P.R.A., was a native of the town.

Devonian Age. [Devonian System.]

Devonian System, so named by Murchison and Sedgwick from its occurrence in Devonshire, is a great series of sandstones, greywackes. slates, limestones, and associated volcanic rocks, 10,000 feet thick, between the Silurian and Carboniferous systems. It represents the more truly marine or open-sea type of deposits, on the whole contemporaneous with the Old Red Sandstone of other areas ; but neither its passage downwards into the Silurian nor upward into the Carboniferous is well developed in England. It extends over Devon, Cornwall, Brittany, Belgium, the Rhine valley, the Harz, and the Alleghanies. Devonian rocks similar to those of Belgium are found in deep borings under London. The system includes valuable ornamental marbles and the *killas* or slate of Cornwall, the matrix of veins of lead, tin, copper. and iron, which metals are also worked in the Harz district. The fauna of these rocks includes the last few graptolites ; numerous corals, especially *Calceola sandalina ;* crinoids ; trilobites, less varied than those of the Silurian ; no less than 1,100 species of brachiopods, which class is represented by *Stringocephalus Burtini* and *Spirifera disjuncta*, and reaches its culmination during this period ; ammonitids, such as *Goniatites ;* nautilids, such as *Orthoceras ;* and occasional remains of fish identical with those of the inland-water deposits of the Old Red Sandstone. The system in Europe is subdivided as follows :—

Upper. *Condrusian* or *Famennian* of Belgium, with the Cypridinia shales, and the Pilton, Pickwell Down, and Cockington beds of Devon, and the Upper Old Red Sandstone of Scotland.

Middle. *Eifelian*, including the *Frasnian*, *Rhynchonella cuboides* beds, and Ramsleigh Limestone, and, below them, the *Givetian*, Stringocephalus Limestone, and Plymouth and Ilfracombe Limestone.

Lower. Coblenzian, Taunusian, and Gedinnian, the Lynton group of Devon and Lower Old Red Sandstone.

Devonport, a municipal and parliamentary borough and port of Devonshire, returning two members to Parliament. It is on the Hamoaze, a part of the estuary of the Tamar, and forms one continuous town with Plymouth. It is protected on the N.E. and E. by a bastioned wall and a ditch cut in the solid rock, and heavy batteries on Mount Wise defend the sea approach. The town is a naval and military station, and has royal dockyards, to the presence of which it owes its prosperity, since there are no special industries save those connected with the dockyards and the military and naval requirements.

Devonshire, the most extreme but one of the south-west counties of England, situated between the English Channel and the Bristol Channel, having Somerset on the N.E., Dorset on the E., and separated from Cornwall on the W. by the river

Tamar. The county contains over a million and a half of acres, and is thus next in size to Yorkshire and Lincolnshire, and has a population of between six and seven hundred thousand. The scenery is very diversified, and the climate, though bleak on the uplands, is very mild on the south coast, where the myrtle, the orange, and the citron flourish in the open air. The coasts are rocky and indented, having Bideford and Morte Bays on the N. and Start and Tor Bays on the S. Dartmoor in the south is a wild tract interspersed with bogs and mosses, having an area of 22 miles by 14, and rising to a height of over 2,000 feet. The island of Lundy in the Bristol Channel is $2\frac{1}{2}$ miles long by 1 broad, and contains 920 acres. This belongs to the county, as does also Drake's Island, a fortified islet in Plymouth Sound. For political purposes Devonshire has eight divisions, each of which returns one member to Parliament. After the capital Exeter, which is the cathedral town, the principal towns are Plymouth, with Devonport and Stonehouse, Tiverton, Tavistock, Barnstaple, and Bideford. Geologically, Devonshire has a sandstone formation in the N. and S., while the basin between them is of carboniferous rock, through which the igneous rock breaks in the south to form the granite tors of Dartmoor. Exmoor in the N. has in Dunkery Beacon the next highest point to Dartmoor. The Northam Burrows in the N. is a curious formation of grass-covered sand bounded by pebble ridges. The central part, called the Vale of Exeter, is very fertile, and forms rich tillage and grazing grounds, producing the cream, butter, and cider for which the county is famed. West Devon resembles Cornwall, and is for mining purposes under the Stannary Act; the "forest" of Dartmoor belonging to the Duchy of Cornwall. It produces copper ore, tin, iron ore, and other minerals, besides potter's clay and china clay. Attempts have been made to exploit profitably the peat stores of Dartmoor and Exmoor, but these have not met with much success. Among the industries are the making of gloves and tanning, and the numerous harbours and seaports give great facilities for fishing. The dockyards of Devonport and Keyham also employ many hands. The principal rivers are the Exe, Torridge, Taw, Plym, Teign, and Tamar, with their many tributaries. Large vessels can ascend the Tamar for five miles from Hamoaze. Owing to the multitude of streams, Devonshire is rich in water power. The boulders of the moorlands seem to belong to a period of glaciers, though no marks of glacier action are to be traced. There are caves with remains of animals and traces of man of the Palæolithic and Neolithic ages, raised beaches, and buried forests. There are many traces of the Romans, among them 500 stations that can be traced, and roads which bear generally the names of ways, paths, or ridges. Few counties are better known than Devonshire; the mild climate, the beautiful scenery, the fact of its having produced many of the naval heroes of the 15th and 16th centuries, have made it the favourite hunting ground of tourists and of novelists. Kingsley, Black, Blackmore, and Whyte Melville have combined to familiarise us with its features.

Devrient, Louis (1784–1832), a German comedian born in Berlin. He was put to a trade, but having a strong liking for the stage he ran away. His first stage appearance was in 1802. His disorderly habits soon landed him in difficulties, and his father made overtures of reconciliation which were very near being accepted. He married Margaret Heefe, and coming to Berlin he made the acquaintance of the actor Iffland, whose successor he became. He played the part of *Franz Moor* in Schiller's *Robbers*, and was a favourite actor for seventeen years. His success was chiefly owing to his great power of throwing himself into his parts. His death was hastened by drink.

Dew is water-vapour condensed into small drops on cool surfaces exposed to the air. Much curious theorising has been indulged in by older physicists as to the nature of dew. The correct principles were first advanced in 1814 by Dr. Wells. The air always holds a certain amount of water-vapour, derived from all the exposure of water on the surface of the earth. For every temperature there is a definite quantity of water-vapour that may be held in a cubic foot at a given pressure; if the temperature be at all lowered, liquid water begins to be deposited; if raised, more vapour may be introduced. At that temperature the air is said to be saturated, for under those conditions it can hold no more vapour. If the air be not saturated with moisture, by lowering its temperature sufficiently a point is reached when further abstraction of heat will cause deposition. This temperature is called the *dew-point* for the air under those conditions of humidity. If there be very little vapour in the air, a sensation of dryness is experienced, and we find that the dew-point is considerably below the existing temperature. At night-time certain bodies radiate heat considerably, especially when the sky is clear and when the bodies have dull surfaces. They thus become very cold, and so may cool neighbouring layers of air down to the dew-point. Dew is deposited on them, and remains till the air becomes warmer, when it may evaporate again. Deposition is facilitated by very gentle wind, which conveys freshly-laden air to the cold surfaces; but stronger wind is liable to warm the condensing bodies, and to directly assist the evaporation of any dew that has been formed. [Evaporation.]

Dewas, a native state of Central India, consisting of two united states with two chiefs. Population 142,162. There is a capital of the same name.

Dewberry (*Rubus cæsius*), a prostrate white-flowered bramble, not uncommon in our woods and thickets, having the comparatively few drupels of the fruit covered with a blue-grey or glaucous waxy bloom, whence its name.

D'Ewes, Sir Simonds (1602–1650), an English antiquary and chronicler, born at Chardstock, in Dorsetshire. His father was a clerk in Chancery, and educated his son at Bury St. Edmunds grammar school, and at St. John's College, Cambridge. The son was called to the bar in 1623, but did not practise, being rich enough not to need the aid of

his profession. He projected a history of Great Britain, and made a valuable collection of notes and observations which now form part of the Harleian MSS. at the British Museum. Among these materials his *Journal of all the Parliaments of Queen Elizabeth* are of much value. D'Ewes became High Sheriff of Suffolk, and was created a baronet in 1641, and the next year he was returned to the Long Parliament, where he sat till 1648, when Pride's Purge dislodged him. His *MS. Notes of the Long Parliament* (1640–1645) form five volumes of the Harleian MSS. His autobiography and correspondence was edited by Mr. Halliwell in 1845.

De Wette, Wilhelm Martin Leberecht (1780–1849), a German theologian, son of a clergyman and born at Ulla, near Weimar. He was educated at the Gymnase of Weimar, and in 1799 entered the University of Jena. In 1807 he became Professor of Theology at Heidelberg. In 1810 he occupied a similar post at Berlin, but was banished in 1819 for manifesting sympathy with the assassin of Kotzebue. He returned to Weimar, where he prepared a work on Luther, wrote a romance, and displayed some talent for preaching. In 1822 he was appointed Professor of Theology at Basel, and died rector of the university there. His chief merits were as a biblical critic and exegetical lecturer.

De Witt, Cornelius (1623–1672), brother of Jan, did good service in the Dutch navy. On the fall of the Orange family he was elected Burgomaster of his native Dort, and deputy for West Friesland and Holland. He fought under De Ruyter. How he died is stated below.

De Witt, Jan (1625–1672), a Dutch statesman. He was son of Jacob de Witt, burgomaster of Dort, and led the party that opposed the Prince of Orange. In 1652, two years after the death of William II., De Witt was made Grand Pensionary of Holland, in which office he was the great opponent of the Orange family, and made an effort to abolish the office of Stadtholder. In 1665 he was engaged in a war with England, which he carried on with vigour, and in 1672 a war between Louis XIV. and the Spanish Netherlands involved Holland. De Witt became very unpopular and resigned his office, and on the occasion of his paying a visit to his brother Cornelius, who was in prison on a charge of conspiring against the life of the Prince of Orange, the mob raised a tumult and murdered the two brothers. Alexandre Dumas has utilised this episode in his *Tulipe Noire*. De Witt was a man of high character, simple manners, and modest disposition.

Dewsbury, a municipal and parliamentary borough of the West Riding of Yorkshire, eight miles S.W. of Leeds, and in the heart of the woollen district. Though of great antiquity, and once an old Saxon ecclesiastical parish of 800 square miles, Dewsbury was of no great importance till its manufactures brought it to the front. Its specialities are heavy woollens, such as army, navy, police, and pilot cloths, druggets, rugs, blankets, and shoddy. It has iron foundries, boiler and machine factories, and flour-mills. It sends one member to Parliament.

Dextrin ($C_6H_{10}O_5$), an isomer of starch (q.v.), from which it is readily prepared. When starch is heated for some hours in an oven, or for thirty minutes to the temperature of 213° C. the grains swell, burst, and turn into a pale brownish substance known as torrefied starch, British gum, or commercial dextrin. It appears either in translucent masses or as a powder. With iodine it gives a fine purplish-red colour. On the addition of cold water to it the dextrin dissolves readily, forming a clear gummy solution, leaving behind some unaltered starch. This gummy solution is largely used in calico-printing and as a substitute for gum-arabic, as on our postage stamps. Dextrin being as insoluble in alcohol as it is soluble in water is precipitated from the solution on the addition of that substance, forming white flocculent masses uniting into translucent colourless lumps. This pure dextrine is not coloured by iodine. Dextrin is formed in baking, often constituting 10 per cent. of bread, and giving a glaze to loaves and biscuits. It is also formed from starch, and even from cellulose (q.v.), by the action of acids and of nitrogenous ferments (q.v.), or zymosis, such as diastase (q.v.), as in the germination (q.v.) of seeds, or that artificially stimulated germination known as malting (q.v.). Dextrin occurs, therefore, in beer. It has also been found in the flesh of animals. It is suggested that some ferment is present in every cell, and that the transformation of starch by its action into dextrin may be a widely important process of digestion preparatory to the transfer of the carbohydrate food to another part of the organism. [Metabolism.]

Dextro-, as a prefix to the chemical names of substances, indicates that the substance in question acts on polarised light, being what is known as *dextro-rotatory*. [Polarisation.]

Dextrose (Glucose, or Grape-Sugar) is a member of the group of carbohydrates (q.v.) termed *hexoses—i.e.* those containing six atoms of carbon in the molecule. It is found in honey and many fruits, and in small quantities in the blood and urine. In the disease diabetes the quantity present in the urine increases greatly, and may reach 10 per cent. It is formed, together with another sugar, *levulose* (q.v.), by boiling cane-sugar with acids, and also by the similar treatment of starch, or cellulose, which are the substances chiefly employed for its manufacture on the large scale. It may be obtained similarly, together with other products, from a class of bodies known as *glucosides* (q.v.). It is soluble in water, and is sweet to the taste, though not as sweet as cane-sugar. As ordinarily obtained it is dextro-rotatory [Polarisation], but it has recently been shown that an equally active, lævo-rotatory, as well as inactive dextrose exists. Its composition is represented by the formula $C_6H_{12}O_6$, and it appears to be an *aldehyde* (q.v.), having a constitution $CH_2OH \cdot (CHOH)_4 \cdot CHO$. It has recently been artificially prepared, and its relations with other sugars shown. It undergoes

fermentation by the action of yeast, with the production of alcohol and carbon-dioxide:

$$C_6H_{12}O_6 = 2C_2H_6O + 2CO_2.$$

For its quantitative estimation it is added to a definite quantity of a boiling standard solution known as *Fehling's solution* (q.v.) until the blue colour which this reagent possesses is completely discharged. It is also estimated by means of a form of polarimeter (q.v.) known as a *saccharimeter* (q.v.). [SUGARS.]

Dey (Turkish a *maternal uncle*), a term applied by the Janissaries (q.v.) to the commanders they elected. Tunis for about a century (till 1703) was governed by these commanders, as was Algiers for nearly two centuries previous to its conquest by the French in 1830.

Dhan. [DAAN.]

Dhang, aborigines of the western Ghâts, India, just south of the Tapti river in Khandeish. Their territory, from them called Dhang, has an area of about 1,000 square miles, with a population of 40,000, and is administered by hereditary chiefs under British protection. The Dhangs, *i.e.* "Highlanders," are still pagans, and mostly speak a Marathi dialect, though their physical traits and usages show that they are a branch of the Bhîl race. [BHÎL.]

Dhangar, a chief division of the Oraon, or primitive people of Orissa, south-east Bengal, but found also in Behar and on the frontier of Assam; appear to be originally of Kolarian stock, but are now largely assimilated to the surrounding Aryans, and generally speak neo-Sanscritic languages—Oraon, Bengali, or Assami, according to the districts in which they are settled.

Dhar, a native Mahratta state of Central India, of about 1.740 square miles in extent. The State is generally fertile, its chief products being wheat, rice, and opium. The capital, of the same name, is surrounded by a mud wall, and contains some striking buildings.

Dharwar, an Indian town in the Bombay Presidency, and capital of the Dharwar district. It is a straggling town, and possesses a considerable trade. It was protected by a fort, which is now in ruins. There are some military cantonments about two miles off. The district has an extent of 4,535 square miles.

Dher, or DHERA. 1. A low-caste people of Gujerat, West India, forming the very lowest and most despised section of the population in the Surat, Ahmedabâd, and Baroda districts; physically, they can scarcely be distinguished from the Bhîls (q.v.), of whom they probably are a branch, degraded by the slavery imposed on them by the Hindus for many ages. The Dhers live in scattered groups, occupying wretched hovels of foliage, and depending on the chase, fishing, and the carcases of dead animals thrown to them by the Hindus. Some are workers in leather. 2. A people of the Talperu valley and Gadalguta Hills, left bank of the Godaveri, Bastar district, India; are half-caste Gonds and Aryans, of Gondi (Dravidian) speech. (Captain Holdich, *Proceedings Royal Geographical Society*, June, 1879.)

Dhimal, Hinduised communities in the Sal forest, Assam, and in Nepal; akin to the Kachâri, but with distinct speech; related to the Mechi or Bodo of the eastern Himalayas (Dalton).

Dhole (*Canis primævus*), the Indian wild dog, sometimes placed in a distinct genus, Cuon. They are fox-like in appearance, and hunt in packs. Some have been reduced to a state of partial domestication, and are used for hog-hunting.

Dholka, an Indian town, is one of the oldest towns of Gujerat, in the Bombay Presidency.

Dholpore, a native state of Rajputana, in Central India, in the ancient province of Agra. It has an area of 1,200 square miles. The capital has the same name.

Dhwalagiri, one of the highest peaks of the Himalayas, on the borders of Nepaul and Thibet. Its name signifies "White Mountain," and its height is 26,826 feet.

Diabase, a dark green or black crystalline rock, occurring mainly in the earlier geological formations, and consisting of a plagioclase felspar, generally oligoclase, and augite, with or without quartz, olivine, apatite, and mica. There is usually more or less magnetite or ilmenite, and the augite has generally been to a considerable extent transformed into a viridite, or green decomposition-product, believed to be epichlorite. Diabase is accordingly considered to be an altered condition of some basaltic lava. It contains from 48 to 50 per cent. of silica.

Diabetes (from a Greek word signifying *to flow through*), a disease characterised by excessive secretion of urine. In *diabetes insipidus* no abnormal constituent is present in the urine secreted; in *diabetes mellitus*, however, a substance allied to grape sugar may be detected on examination of the urine. The former disease is very rare, and *diabetes mellitus*, or diabetes proper, will alone be further considered here. As regards the pathology of diabetes but little is known with certainty. The chief symptoms are increased appetite, uncontrollable thirst, wasting, dryness of skin, and the secretion of considerable quantities of urine, usually of high specific gravity and containing sugar. The disease in its most serious form is usually met with in young male adults; its progress in such subjects is apt to be rapid, and it generally proves fatal. Death is sometimes ushered in by coma (q.v.). Diabetes is not always an intractable disease; in middle-aged and elderly people particularly it often admits of considerable alleviation, if not of cure. The main form of treatment adopted is dietetic. All sugar-forming food is excluded from the patient's diet. He must rigidly abstain not only from sugar, but from starch, which is converted into sugar by the digestive juices. Gluten bread must be substituted for ordinary bread, and such articles of food as potatoes carefully eschewed. Glycerine has been

recommended in place of sugar for sweetening purposes, and since the discovery of saccharin. that drug has been largely employed. A form of treatment which has been highly recommended, but which is certainly not based on the exclusion of sugar-forming foods, is the milk treatment, in which the patient consumes nothing but milk. Certain preparations of opium seem to be of service in the treatment of diabetes.

Diablerets, a mountain group of Switzerland, situate in the Bernese Alps, between the cantons of Vaud and Valais. The highest point is 10,620 feet. There is much clay in the formation, and the result of glacier action upon this is to cause frequent and considerable landslips, the most considerable of which have been those of 1714 and 1749. In the case of the latter of these, the Liserne was choked, and its waters formed the small lake of Derborence.

Diadema, a genus of sea urchins and the type of the family *Diademidæ*. The sub-genus *Pseudodiadema* includes a large number of species in the Oolitic and Cretaceous rocks. In an existing species eyes have recently been described.

Diæresis (Gk. *diairĕsis*, division), a mark (two dots) on the second of two vowels ordinarily forming a diphthong, to indicate that they are to be separately pronounced (*e.g.* "aërial").

Diagnosis, the art of distinguishing between different forms of disease. Diagnosis is based upon an analysis of symptoms (phenomena observed by the patient) and physical signs (phenomena observed by the physician). The methods employed in the detection and elucidation of physical signs have been greatly perfected within recent years. The methods of percussion of the chest, invented by Avenbrugger, and of auscultation, invented by Laennec, threw much light upon thoracic affections. Methodical examination of the urine has proved of the greatest service in detecting many forms of disease. Again, the laryngoscope and the ophthalmoscope, and the employment of electricity, have greatly perfected the means available for arriving at a correct diagnosis. The latest development of the art of diagnosis consists in the application of bacteriological investigation, as, for example, to the sputum of cases of suspected phthisis.

Diagonal, the line joining opposite corners of a polygon. It may be readily determined when the polygon is regular and with an even number of angular points, but if the figure is complex the rule is to join those corners which are separated by half the number of sides possessed by the polygon. When the number of sides is odd, the half is taken to the nearest figure; thus a diagonal of a heptagon, with seven sides, joins points separated by three sides travelling one way, and by four travelling the reverse way, round the figure.

Diagonal Scale, an arrangement supplied with most sets of scales for length measurement, for accurate estimation of small fractional lengths. It is not much employed practically. The principle is that if two lines are inclined to each other and meet at any point, their divergence is perfectly uniform as we proceed from that point. If at a distance of ten inches from their intersection the distance apart of corresponding points on the two lines is $\frac{1}{10}$th inch, then at a distance of one inch from their intersection the distance apart will be only $\frac{1}{100}$th inch, and so on proportionately.

Dialectic (Gk. *dialektike*, conversation), properly disputation, used by the Sophists (q.v.) to exhibit their own skill; by Socrates (1) to expose his hearers' prejudices and so convince them of their ignorance; (2) to arrive at the nature of general conceptions such as virtue, justice, etc. (Xenophon says that Socrates, connecting the meanings of *dialegomai*, to converse, and *dialegein*, its active voice, to distribute, said that dialectic was so called because it "classed things according to their kinds.") Plato's dialectic is the science dealing with the real essences which enter into and constitute the true nature of the particulars in a class and are expressed in its definition. In one passage (*Rep.* vi., sub fin.) it is said to take up the fundamental ideas of the sciences (number, mass, motion, etc.) and explain their relation to one another and the supreme law of the universe or Idea of Good. (We need hardly add that this conception is not worked out.) Hegel's dialectic is that supreme process of thought which deals with and solves the difficulties and contradictions involved in fundamental ideas. [Hegel, Plato.]

Diallage, a variety of augite, crystallising in the oblique system, with more perfect cleavage than augite (q.v.), the same absence of pleochroism, and a pearly or sub-metallic lustre. Its crystals often contain numerous acicular microliths arranged in definite directions, and fluid-cavities. By ordinary transmitted light they are pale green or brownish yellow. With labradorite felspar this mineral makes up the rockgabbro (q.v.). Its hardness is 4 and its specific gravity about 3·29.

Dials are instruments used for recording time by means of shadows derived from the sun or moon. They were of much importance before the invention of clocks and watches, but are now of little more than historic interest. The principle upon which dials are made is readily explicable, though in the case of dials constructed for various positions of pointer and plate, certain difficulties of detail manifest themselves. The earth rotates uniformly about its axis, thereby causing an appearance of uniform rotation of external bodies, such as the sun or other stars, about the earth. It is true that the earth is travelling in an elliptic orbit round the sun, with a speed not strictly uniform; but its motion once round its own axis is so much more rapidly effected than its motion once round the sun that we may disregard this latter in discussing the daily position of the sun as seen from the earth. Assuming, then, that the sun appears to swing round the axis of the earth at the constant rate of one revolution per day, it follows that any rod lying in this axis or parallel to it will throw a shadow that also swings uniformly round once per day. We cannot adjust a rod in the actual axis of the earth where it

may cast a shadow, but we can readily fix one parallel to the axis at any convenient spot on the earth's surface. We may also adjust a plate near the rod which shall exhibit the shadow and its motions. The plate is marked with lines showing the position of the shadow at the different hours of the day, the way in which the lines are drawn depending on the position of the plate. The marking is simplest when the rod or *gnomon*, pointing to the pole-star, is perpendicular to the plate or *dial-plane;* then the hour lines are at equal angular distances of 15° all round the dial. For the marking when the plate is vertical or horizontal, a little spherical geometry is required.

Dialypetalous. [POLYPETALOUS.]

Dialysis. Graham found that animal or vegetable membranes were impervious to some substances in solution, while others possessed the power of passing through such structures. All soluble substances he thus divided into two classes, *crystalloids* and *colloids*. The latter are those to whose solutions the membrane acted as an impervious wall, and examples of such substance are the gums, glue, precipitated silica, while the crystalloids include all substances of a crystalline nature as salt, sugar, etc. A colloid can be separated therefore from a crystalloid by placing the solutions in a small cup, the bottom of which consists of parchment, and floating it in a basin of water. The crystalloid passes into the outer water while the colloid remains in the cup. By repetition of this process—*Dialysis*—the separation may be made complete.

Diamagnetism, in *Physics*, denotes that branch of magnetism which treats of those substances which are repelled by the poles of a magnet, instead of being attracted like iron or steel. Among such diamagnetic substances we find bismuth, phosphorus, zinc, mercury, water, and air. Their repulsion from the poles of a powerful magnet is very slight, and is insignificant compared with the attraction of iron towards the poles. [MAGNETISM, INDUCTION.]

Diamantina, or TIJUCO, is a town in Brazil, the centre of a diamond district in the province of Minas Geraes. The inhabitants are almost all engaged in gold or diamond mining.

Diameter, in *Geometry*, a term employed generally in reference to the conic sections. Each of these curves possesses a centre (q.v.), a point which bisects all lines passing through it from one side of the curve to the other. Any such line passing through the centre is called a diameter. In the case of a circle the diameters are all equal. In the ellipse we have pairs of equal diameters: the longest and shortest are impaired and are called the major and minor axes respectively. In the parabola the centre is at an infinite distance and the diameters consequently parallel and infinitely long. In any conic, parallel chords are all bisected by the same diameter.

Diamond (named from the Greek *adamas*, unsubduable), the hardest of precious stones, being 10 in von Mohs' scale. It consists of pure carbon, burning in strong heat or in pure oxygen into carbonic acid gas. It is insoluble in acids. From graphite (q.v.) it differs in crystalline system and in transparency. The forms in which it occurs, the octahedron, rhombic dodecahedron, triakisoctahedron and hexakisoctahedron, as well as the rarer cube, all belong to the Cubic system. Some of the crystals are nearly spherical, having curved faces and edges. The mineral is rather brittle, cleaving readily parallel to the octahedral faces. Its specific gravity is 3·52. Diamond when at its purest is colourless, transparent, adamantine in lustre, with the high refractive index 2·42; but it also occurs grey, brown, blue, red, yellow, green, or black. Diamonds were formerly only obtained from the Deccan, where they occurred in recent derivative deposits, no original matrix being known. Since the beginning of the last century they have been obtained from Minas Geraes, Matto Grosso, and Bahia, in Brazil, in itacolumite, a quartzose mica-slate or metamorphosed sandstone, and in soil derived from it. Since 1867 diamonds have been largely obtained from Griqualand West and the Orange Free State, in South Africa, where the town of Kimberley has arisen, forty million pounds' worth having been exported since the first discovery. They were found at first in alluvial shingle; but subsequently in "pipes" of a shaley decomposed diabase, or closely related rock of igneous origin. The mode of origin of the mineral is by no means clear, and no satisfactory demonstration has as yet been given of its having, as alleged, been prepared artificially. Diamonds are cut and polished by means of a wheel armed with their own powder, the industry being carried on in Amsterdam and London. Three forms are cut, the *brilliant*, the *rose*, and the *table*. The brilliant consists of a double pyramid, the upper and more truncated half having a *table* or horizontal eight-sided facet, surrounded by a *bezil* or series of smaller facets, whilst the lower and more pyramidal half extending from the *girdle*, or common base of the pyramids, to which the setting is attached, is called the *collet side*, and terminates in a minute flat facet, the *collet*. The *rose* is flat on one side, with triangular facets, of which the central ones meet in a point on the other. The *table*, adopted only for thin stones, has two parallel, wide, tabular facets with rows of smaller ones between them. The weight of diamonds is reckoned by the *carat*, which is a little more than 205 milligrams. The price of brilliants of first quality as to colour or "water," well cut, but not of exceptional size, is reckoned at from £8 to £10 for the first carat, increasing as the square of the weight in carats, *e.g.* two carats, £32 to £40, three carats £72 to £90. Among the most celebrated large diamonds are the Orloff, in the Russian sceptre, 194¾ carats, and the Koh-i-Noor, 106$\frac{1}{16}$ carats, since the annexation of the Punjaub in 1849 the property of her Majesty. Besides its value as a gem, diamond is used by glaziers for cutting glass, and when imperfect in form and brilliancy, under the name of *bort*, for polishing. A brownish black porous impure variety, with a density less than 3·42, is found near

Bahia in large masses, and, under the name *carbonado*, is now largely used in boring wells, trials for mines, etc., several pieces of it being set round the margin of a revolving steel tube or "crown."

Diamond Beetle, a small Brazilian beetle, so called from its brilliant metallic colour. The elytra or wing cases are marked by spots of a fine golden green. It is a favourite microscopic object, and, as its colours are permanent, it is also used for various decorative purposes. Its zoological name is *Entimus imperialis*, Font.

Diamond Necklace, THE, in French history, gave rise to a scandal, which eventually intensified the feeling against the unhappy Marie Antoinette. The necklace, which was to surpass anything previously conceived, consisted altogether of 800 diamonds, in three triple rows, with a pendant in the form of a cross and crown, surmounted by the fleur-de-lis. Its value is estimated at between £80,000 and £100,000 sterling. The makers (Boehmer and Bassauge, jewellers of Paris) offered it in 1783 to Louis XVI. for Marie Antoinette. She, however, patriotically declined it as too expensive. In 1785, however, M. Boehmer complained to a lady-in-waiting that the queen had not yet paid the first instalment of the price of the necklace, which he said she had bought privately through Cardinal de Rohan, a dissolute nobleman, lately ambassador at Vienna, who had been excluded from Court. This led to the discovery of an elaborate plot. One Madame de Lamotte, of noble descent but disreputable antecedents, had persuaded the Cardinal that by acting as intermediary for the queen in the purchase of the necklace he would be restored to favour, and by finding a woman to personate the queen and a man to personate a confidential servant, had obtained the necklace, the fate of which was never ascertained. De Rohan's enemies at Court prevented the scandal from being hushed up, and the persons implicated, including Cagliostro (q.v.), were tried in 1786. Madame de Lamotte was sentenced to be publicly whipped, branded, and banished, her husband condemned to the galleys (but he had escaped), the valet banished; the rest were acquitted. To the last many persons believed in the queen's complicity.

Diamond Sparrow (*Spermestes guttatus*), a cage-bird from Australia. Plumage shades of grey, a black band irregularly spotted with white on the sides, a patch of carmine on the tail.

Diana, an Italian goddess, chiefly of the Sabine and Latin races, afterwards identified with Artemis of the Greek mythology, whose bow and other attributes she assumed. The name is generally taken to be a feminine form of Janus. Horace, in his *Odes*, alludes to her threefold character of Hecate, Diana, and Phœbe, and calls her "*Dira triformis*," and speaks of her as presiding over maternity in her character as Lucina. She is not really identical with "Diana of the Ephesians," who was probably the same as Cybele.

Diana of Poitiers (1499–1566), DUCHESS OF VALENTINOIS, a noted Frenchwoman, descended from the noble family of Poitiers in Dauphiné. At the age of 13 she married Louis de Brezé, Comte de Maulevrier, Grand-Seneschal of Normandy, and grandson of Agnes Sorel. Left a widow in 1531, she became the mistress of the Duke of Orleans, who succeeded to the throne as Henry II. in 1547. She had great influence over the king, and retained it till his death in 1559, holding her own with Catherine de Medici, who, moreover, had great respect for her. After the king's death she lived in retirement at her castle of Anet. She raised a mausoleum to her husband in Rouen cathedral, and her statue by Benvenuto Cellini is now at Paris, as is also a statue of her by Jean Goujon. She served as subject to many sculptors and painters.

Dianthus. [PINK.]

Diapason (Greek *dia pasōn*, through all, *i.e.* the strings of the lyre), a term originally applied to the musical octave. In French it means a tuning fork, as setting the pitch, then the pitch itself. In the organ (q.v.) the term is applied to the most important stops, which are in connection with the whole keyboard.

Diaper (Old Fr. *diasprc*, from Gk. *iaspis*, jasper), figured linen cloth, for napkins, etc. In architecture the term is applied to panelling filled up with a painted pattern, etc., or with carving in low relief.

Diaphoretics, drugs which increase the activity of cutaneous secretion and thus promote perspiration. The chief of these are pilocarpine, acetate of ammonium, senega, antimony, and camphor. A vapour bath is a most efficacious means of producing a diaphoretic action.

Diaphragm, the structure which divides the cavity of the thorax from that of the abdomen. It forms an arched dome with its concavity downwards, and contraction of the muscular fibres of the diaphragm by reducing the height of the dome increases the capacity of the chest. The diaphragm is thus the chief muscle concerned in inspiration. The diaphragm is attached posteriorly to the lumbar vertebræ by two ligamentous structures known as the pillars of the diaphragm, laterally its fibres take origin from the six lower ribs, and in front it is attached to the ensiform cartilage. Through the diaphragm pass the aorta with the thoracic duct and vena azygos major; the œsophagus, with the pneumogastric nerves, and the vena cava inferior.

Diarbekir, a town of Asiatic Turkey, and head of a pashalic of the same name, is situated on a high bank overlooking the Tigris, and is surrounded by a lofty wall now partly in ruins. It has archbishops of the Armenian, Syrian, and Chaldaic Catholic churches, and besides possessing a considerable trade has manufactures of iron and copper wares, and of leather, silk, woollen, and cotton goods. Armida was the old name, and the town is of great antiquity. It was restored under the Roman Emperors Valens and Valentinian, and was fortified

against the Persians by Constantine, and was taken by them more than once. The Turks obtained possession of it in the 12th century, and there are many traces of Arab inscriptions on the walls. Diarbekir is on the postal route between Constantinople and Bagdad.

Diarrhœa (from a Greek word signifying *to flow through*), a condition in which the intestinal discharges are more liquid, more frequent, and in larger quantity than is natural. Diarrhœa is frequently accompanied by vomiting and by pain or colic. The most common cause is the ingestion of some irritant substance. Warm weather is particularly associated with diarrhœa of this type, and it has been supposed that a temperature of 60° Fahrenheit and upwards tends to favour the production of some diarrhœa-causing poison which may enter the system in water and the like. Diarrhœa in some people arises whenever the system is below par; again, in other patients diarrhœa is a common occurrence as the result of exposure to cold. Disease of the intestinal wall (catarrh, ulceration, tubercular and cancerous disease) is usually accompanied by diarrhœa. Acute diarrhœa is generally best treated at the outset in adults by the administration of half an ounce of castor oil with ten minims of laudanum (in children opium, of course, should only be used under medical advice). The food taken should be of a bland, non-irritating character; it is better to avoid all solid food for a time. Milk, with the white of an egg beaten up in it, with the addition of a little brandy, is an excellent preparation. If the diarrhœa persists it may be necessary to resort to astringents. The summer diarrhœa of infants is oftentimes a very serious affection, and medical advice should be procured in the first instance. It is more common among children brought up by hand than in those having the breast. A useful form of treatment in the former case consists in the addition of a little barley water or some such farinaceous substance to the milk to break up the curd. Grey powder and bismuth are often of great service in the diarrhœa of infants. If collapse be extreme a warm bath is a useful plan of treatment. In chronic diarrhœa diet is a matter of great importance. Raw meat has often been employed with good results. Astringents innumerable may be employed. Kino, catechu, and red gum are probably the most useful.

Diastase (from the Greek *diistēmi*, I separate), a name applied by Payen and Persoz in 1833 to a nitrogenous ferment present in germinating seeds and perhaps in the cells of other parts of plants. It has never been satisfactorily separated or analysed; but its discoverers stated that it formed $\frac{1}{300}$th of the weight of malt and that it is capable of bringing about, by an action which cannot be said to be understood, the transformation of 2,000 times its own weight of starch into sugar. Other albuminoids are now known to produce the same change, though less actively. Their action is analogous to that of the ptyalin in the saliva of the higher animals. It is the presence of diastase that enables the brewer to use four parts of raw grain to one of malt in the process of mashing. [BREWING.]

Diathermancy, that quality of certain substances which renders them capable of transmitting heat-radiation without absorbing it. No substance is perfectly diathermanous or transparent to heat, just as no body is perfectly transparent to light. Glass allows of the passage of bright heat, as may be felt in a glass conservatory on a sunny day; but it is *athermanous* or opaque to dark heat, which renders it difficult for the heat that has entered the conservatory to pass out again. Rock-crystal is remarkably transparent for dark heat; this makes it a useful material for prisms and lenses that are employed to deviate and concentrate dark heat-rays. [HEAT.]

Diathesis (Gk. *disposition*) a term applied to a particular constitution of the body in which there is a liability to certain forms of disease. Thus the terms "gouty diathesis," "strumous diathesis" and the like. In the "hæmorrhagic diathesis" a tendency to bleeding exists. Thus as the result of a slight wound a considerable loss of blood may occur, profuse bleeding at the nose, too, is a common phenomenon. This curious condition is markedly hereditary and only shows itself as a rule in males, though the diathesis is transmitted as a rule through the mother, she herself remaining unaffected by the condition.

Diatoms, a numerous group of microscopic plants, sometimes classed among Algæ (q.v.), but now ranked as an independent class of the Thallophyta (q.v.). They are unicellular, and have within their cell-wall a siliceous case composed of two halves or *valves*, one fitting over the other like the lid over a pill-box. They vary in size from less than one-third of a millimetre to three millimetres in length, the marine forms being the largest. In external form they are extremely varied, being round, oval, linear, fusiform, crescent-shaped, cuneate, or S-shaped (sigmoid); and their siliceous cases exhibit remarkably varied minute geometrical patterns as if of ornamentation, which have been used by microscopists to test the power of their lenses. Some diatoms occur on moist rocks, others in pools or streams on mud- or water-plants, and others in brackish or salt water on algæ or in the stomachs of marine animals. Some are free, others loosely united in chains, and others attached by gelatinous threads to foreign bodies. Some species abound in the ice and deep waters of polar regions, whilst others occur in hot springs. Within their cells are plate-like chloroplastids; but the green colour is masked by a brown substance known as *diatomin*. Diatoms multiply rapidly by bipartition, each individual or *frustule* separating into two valves, each of which forms a new but slightly smaller half. After several such bipartitions, a larger cell or *auxospore* is formed, and then the process recommences. In some cases the auxospore results from a true process of conjugation, and is, therefore, a zygospore (q.v.). Vast deposits composed almost exclusively of diatoms have been found in many places, most being of Tertiary age. That

at Richmond, Virginia, is 40 feet thick, and extends for many miles. Under the names *tripoli*, *polishing powder*, *mountain meal*, *kiesel-guhr*, and *dynamite-earth*, they are extensively employed as a polishing material or as an absorbent for nitro-glycerine in the manufacture of dynamite (q.v.).

Diatonic Scale (Greek *dia tonōn*, by tones), a scale which proceeds mainly by intervals of whole tones. The scale of C major has five whole tones and two half tones.

Diaz, Bartholomew (d. 1500), was a Portuguese navigator who, starting upon an exploring expedition with two vessels, sailed down the coast of Africa and anchored at Agras das Voltas in 29° S. latitude. He sailed on south and doubled the Cape of Good Hope, and reached the bay of Lagoa on the east coast. It was his desire to sail on in search of Prester John's country, but his sailors, like those of Columbus, thwarted his wishes. He again doubled the Cape, to which he gave the name of Cabo Tormentoso on account of its storms, but this name was changed by King John II. of Portugal to that which it now bears. In 1500 Diaz commanded a vessel in Cabral's expedition, which resulted in the discovery of Brazil, if, indeed, it had not already been discovered, a point which is doubtful. On the way home Diaz was lost together with the vessel which he commanded.

Diaz del Castillo, Bernal (d. 1560) accompanied Cortes to Mexico in 1519, taking a great part in the events that accompanied the conquest of that country, and eventually dying there. He wrote a history of the conquest, which was published at Madrid in 1632, and has proved of great value to subsequent chroniclers as being the work of an eye-witness of the deeds described.

Diaz de la Peña, Narcisso Virgilio (1809–1876), a French painter of Spanish descent, born at Bordeaux. He was of considerable though irregular talent, and excelled chiefly as a colourist. He was a good landscape painter, but committed the fault of putting his landscapes into the background, and filling the foreground with badly-drawn figures of nymphs and cupids and the like. Among his best known pictures are *Nymphes de Calypso* (1840), *Gypsies going to the Feast* (1844), and *Mare aux Vipères* (1857).

Diazo Compounds are a class of compounds which are characterised by the presence of two nitrogen atoms united to one another. The most important of the diazo-compounds are those of benzene derivatives and allied substances. The benzene diazo-compounds consist of the two nitrogens united on the one side to a benzene derivative and on the other to a monovalent radical —*e.g.* diazobenzene chloride is $C_6H_5.N : N.Cl$. These compounds are produced by the action of nitrous acid or a nitrite upon the salt of an amido-benzene derivative; thus from nitrate of aniline, $C_6H_5NH_2.HNO_3 + HNO_2 = C_6H_5N : N.NO_3$ (diazobenzene nitrate) $+ 2OH_2$. They are usually colourless, soluble crystalline bodies, but turn yellow or brown if exposed to the air. They are easily decomposed, and explode by concussion if heated. They were discovered by Griess in 1859, and the discovery is one of the most fruitful and important of modern organic chemistry, as the compounds are invaluable in pure chemistry, since they furnish means of innumerable important synthetic and other reactions, and in applied chemistry, especially in the preparation of various dyes and coal-tar colours.

Dibdin, Charles, actor, musician, dramatist, and song-writer, was born at Southampton in 1745. He became musical leader at Covent Garden, and manager of the Sans Souci theatre; he wrote also numerous light pieces, and a *Complete History of the English Stage* (1795); but his fame lives almost entirely by his numerous nautical songs. Among the most celebrated of these are *Tom Bowling*, *The Jolly Young Waterman*, *Poor Jack*, etc. Dibdin, who in 1803 wrote an interesting account of his professional life, and whose biography was later written by his son, died on July 25, 1814. It has been said, with some truth, that during the long French wars the naval songs of Dibdin conduced more than anything else to the satisfactory manning of the fleet.

Dibdin, Thomas Frognal (1776–1847), the nephew of Charles Dibdin, was an English bibliographer. Educated at Eton and Oxford, he adopted the law as a profession, and practised for a time. He then entered holy orders and became a popular preacher in London. He was for some time librarian to Lord Spencer. In 1812 he was elected first vice-president of the Roxburghe Club. Among his works were *Bibliomania*, *Bibliographical Decameron*, *Typographical Antiquities of Great Britain*, and *Reminiscences of a Literary Life* (published 1836).

Dibranchiata, the sub-class of Cephalopoda (q.v.) including all the living forms excepting the Nautilus. The name is given them because they all possess one pair of gills, whereas the Nautilus, and probably the others of the second sub-class, possess two pairs. The shell is very varied: it may be entirely external, as in the female Paper Nautilus (*Argonauta*), but is then not chambered; it may be chambered and only partly external as in *Spirula*, or chambered and wholly internal as in the Belemnites—in these latter the chambered portion is protected by a solid "guard"—or the shell may be a laminated plate, wholly internal, calcareous in the Cuttle Fish and horny in the Squids; finally, the shell may be absent as in the Devil Fish (*Octopus*). The animal has never more than ten arms, and in one group has only eight; these are always provided with suckers. The siphon is a closed funnel-shaped aperture; an ink sac is always present. The Dibranchiata are divided into two orders: the Decapoda (q.v.), including the Belemnites, *Spirula*, Cuttle Fish, Squids, etc., and the Octapoda (q.v.), including the Devil Fish, Paper Nautilus, etc. The class began in the Trias and has been since increasing in importance, while the Tetrabranchs have become almost extinct.

Dice (plural of *die*, Fr. *dé*, from Lat. *datum*, given). The invention of dice was ascribed by the Greeks to the Lydians, or to the Homeric hero

Palamedes: but they are found in very early Egyptian tombs, and are mentioned in the Rig-Veda. In Greece and Rome the small bones from the ankles of sheep and goats were used. Originally the game seems to have been one of skill, the bones being thrown up and caught. Later, the sides of the bones were marked with numbers, the rounded ends being left blank. The values of each throw were determined by special rules, and were not necessarily those of the numbers. Each throw had its own name. Stone dice were also used, and the rounded ends were sometimes squared and numbered. The game was often forbidden by law in Greece and Rome, and also in the Middle Ages, by St. Louis for instance. Playing dice for money has been illegal in England since the reign of George I.

Diceras, a remarkable extinct genus of *Lamellibranch mollusca*, allied to the modern *Chama*. The two valves were almost equal, and the "umbo," or beak, is of great size in each valve, and is coiled as a loose spiral; hence, single valves resemble the shells of Gastropoda. The genus occurs in the Oolitic rocks of the Continent. A species of a closely allied genus occurs in the Lower Greensand of the South of England; it is known as *Requienia lonsdalei*.

Dichlamydeous, a term of Greek origin applied to such flowering plants as have a perianth of two whorls of leaves—*i.e.* both calyx and corolla (q.v.)—and are also known as *complete*, in contradistinction to the Incompletæ, which are either monochlamydeous, having one floral envelope, or achlamydeous, having none.

Dichotomy, dividing into two, especially applied to certain growing-points and other structures in plants in which such division occurs without the formation of buds. In the axial structures of the lower plants this often arises from the division of a large apical cell; in the leaf-structures of higher plants it originates in the division of a mass of smaller cells forming an apical *meristem* (q.v.). The term was formerly applied to such inflorescences as the cymes of the pink tribe, in which two lateral buds form one on either side of a terminal one, which are now termed *dichasia*.

Dichroism, in *Crystallography*, is that property of many crystals by which they appear of different colours when viewed in different directions. Certain fluids are also called dichroic when they are of different colours when viewed by transmitted or reflected light, or when the depth of the fluid is varied. These are more correctly known as fluorescent.

Dick, James (1743–1828), a native of Morayshire, and afterwards a London merchant. In 1828 he left over £100,000 for the education of natives of Moray, Banff, and Aberdeen. The teachers employed under this system were appointed by examination, and payment to the schools was regulated by results, the average grant being £30.

Dick, Robert (1811–1866), a Scottish geologist and botanist, who pursued his scientific studies while earning his livelihood as a tradesman of Thurso. Samuel Smiles published a life of him in 1878.

Dickens, Charles, was born at Landport, Portsmouth, February 7th, 1812. He was a son of John Dickens, then stationed in Portsmouth Dockyard as a clerk in the Navy Pay Office. In 1814 the elder Dickens was recalled to London, and two years later he went to Chatham, where the future novelist attended a school in Gibraltar Place. As a child he read deeply, and is even said to have attempted original writing. Owing to reforms in the Admiralty, John Dickens lost his post and most of his income in 1821. He moved with his family to London; and in the suburb of Camden Town Charles Dickens experienced that pinch of poverty to which frequent reference is made in his works. The father was soon arrested for debt, and Charles was placed in a blacking manufactory in Hungerford Market, where he was employed in putting labels on the blacking-bottles. The degradation of his surroundings made a deep and lasting impression upon his mind. When the father recovered his liberty, the boy was sent to a private school in the Hampstead Road. On leaving school he entered a solicitor's office, where he taught himself shorthand, and in his seventeenth year he became a reporter at Doctors' Commons. At this time he ardently longed to go upon the stage, but fortunately for the future of literature his desires remained unfulfilled. In 1831 he joined the reporting staff of the *True Sun*, and in 1834 he became a reporter for the *Morning Chronicle*. Dickens began his real career, however, in December, 1833, when he published in the *Old Monthly Magazine* his first original article, entitled "A Dinner at Poplar Walk." Other papers succeeded, and he made a profitable engagement with the conductors of the *Morning Chronicle* to supply a series of papers for the evening issue of that journal. These papers were reprinted in 1836 under the title of *Sketches by Boz*. A comic opera, *The Village Coquettes*, appeared the same year. The success of the *Sketches by Boz* led Dickens to undertake in 1837 the production of a serial, in monthly parts, entitled *The Posthumous Papers of the Pickwick Club*. The monthly numbers of this immortal work attained almost at once a phenomenal popularity, and that popularity has never since declined. *Oliver Twist* (which first appeared in *Bentley's Miscellany*, of which Dickens was for a time editor) was published in 1838. This powerful story lifted the veil upon life in the provincial workhouses and in the London slums. It was succeeded by *Nicholas Nickleby* (1839), one of the best as well as one of the most widely-appreciated of the novelist's works. In 1840 Dickens undertook a serial collection of stories, called *Master Humphrey's Clock*. *The Old Curiosity Shop* (1840), which contains for its central figure that exquisite and pathetic creation, "Little Nell"; and *Barnaby Rudge* (1841), a tale associated with the Lord George Gordon Riots, appeared in this series, together with a number of shorter stories and sketches. In 1842 Dickens visited the United States, and on his return published his *American Notes for General Circulation*, a work which gave great offence in the States

for its too caustic pictures of Transatlantic society. *Martin Chuzzlewit*, which appeared in 1843, also contained unflattering representations of American character. Though regarded as one of the most masterly of the author's works, it was received with less favour than its predecessors. It has since advanced largely in the public estimation. however, and several of its characters, including Mrs. Gamp and Mr. Pecksniff, are as famous as any the novelist has drawn. The "Christmas Books"—which included *The Christmas Carol*, *The Chimes*, *The Cricket on the Hearth*, *The Battle of Life*, *The Haunted Man*, and *The Ghost's Bargain*—were issued at intervals from 1843 to 1848. In 1845–46 Dickens visited Italy, and the result of his travels appeared in a series of sketches, *Pictures from Italy*, which were published in the *Daily News*. Dickens was the editor of this new journal, but finding the work uncongenial, he relinquished it, and returned to his creative work in literature. What may be termed his second period in fiction began with the publication of *Dombey and Son*, in monthly numbers, in 1846–48. Then came *David Copperfield* (1849–50), which is usually regarded as one of the finest of his works. In great part it was a record of the novelist's own experiences, so that its humorous and pathetic revelations possess an autobiographic interest. Dickens established in 1850 a cheap weekly periodical, called *Household Words*, but this was superseded in 1859 by *All the Year Round*, which he conducted until his death. *Bleak House*, a novel depicting the abuses of the Court of Chancery, was published in 1852–53; and *The Child's History of England* and *Hard Times*, a tale dealing with questions affecting the working man, in 1854. *Little Dorrit*, which depicts the self-sacrificing devotion of a daughter for a worthless parent, appeared in 1855–57; and during its progress Dickens removed from London to Gad's Hill Place, near Rochester, where he ever afterwards resided. *A Tale of Two Cities*, which graphically describes the horrors of the French Revolution, was published in 1859. At this time, Dickens undertook his first series of public readings. Though extremely popular and profitable, the readings undoubtedly sapped his physical strength; and his intellectual productiveness from this period was not so great as in previous years. *Great Expectations* appeared in 1860–61; *The Uncommercial Traveller* in 1861; *Our Mutual Friend*, the last of his lengthy completed works, in 1864–5; while Christmas stories, mainly from his pen, appeared at the close of every year in *All the Year Round*. The novelist paid a second visit to the United States in 1867–8, and was received everywhere with the greatest enthusiasm. The success of his public readings was equal to that which he achieved in his native land. After his return to England he began the composition of *The Mystery of Edwin Drood*, which was destined to be the last of his works. The first numbers of the new serial were published in 1870, but the story remained unfinished at his death. In March, 1870, Dickens gave his last reading in St. James's Hall, the scene being a very memorable one. Medical advisers frequently warned the novelist that he was overtaxing his strength and energies, but his nature never permitted him to rest, and he literally died in harness. On the 8th of June he was seized with a fit at his residence, Gad's Hill Place, and never recovered from the attack. He expired on the following morning, June 9th, 1870, in his fifty-ninth year. On the 14th of June he was interred in Poet's Corner, Westminster Abbey. The news of his death was received with profound and universal regret throughout the English-speaking world. Dickens married in 1838 a daughter of George Hogarth, the well-known musical critic and writer. For the encouragement of young authors the novelist was especially distinguished, and he was associated with Bulwer Lytton and others in founding the Guild of Literature and Art. He also took an active part in the administration of the Royal Literary Fund. Dickens was one of the greatest and most original of English novelists. Notwithstanding the tendency to caricature in his writings, the characters in his vast portrait gallery are, in the main, true to life. They are distinct types, creations as graphic as they are human. In the pages of this prince of story-tellers comedy and tragedy jostle each other as they do in human existence, and he has equal command over the springs of laughter and of tears. Were there no other preservative qualities in his works, their intensity of feeling alone would ensure them the continuous appreciation of posterity.

Diclinous, imperfect or unisexual, a term applied to those plants in which the stamens or other male organs, and the carpels or other female organs, are either in separate flowers on the same plant (*monœcious*) or are on distinct plants (*diœcious*).

Dicotyledons, the larger, and, in most respects, the more highly organised class of angiospermous, or fruit-bearing flowering plants. In their embryos they have in almost all cases two cotyledons (q.v.), or seed-leaves, and a primary root or radicle which is commonly protruded in germination and develops into a tap-root. The fibro-vascular bundles in the stem are *open*, *i.e.* retain a layer of *cambium* (q.v.), or growing tissue, between their wood and their bast. The bundles form a ring of wedge-shaped masses round a central pith or *medulla*, from which there radiate bands of tissue between the bundles, known as *medullary rays*. Part of these rays, the *interfascicular cambium*, in conjunction with the cambium within the bundles, which is termed *fascicular*, forms a complete ring of this soft protoplasmic tissue round the stem, from which additions are made to the wood on the inside, and to the inner bark or bast on the outside. Thus the wood is in more or less distinct seasonal (generally annual) rings, and the whole "bark" (q.v.), both the inner or bast, which is fibrous. and the outer or *periderm*, which is often corky, is separable. The leaves often have a pair of *stipules* (q.v.) at their base, have commonly distinct stalks or *petioles*. are often compound or divided, have not seldom hairy surfaces, and have a complex *venation* or system of vascular bundles, branching into many degrees of fineness of the so-called veins and generally forming an irregular network, whence they are termed *reticulate*. The leaves of the perianth, or calyx and corolla, are commonly in whorls of five, or, in

reduced types, of fours or twos; the stamens, two, four, five, ten, or indefinite in number; and the carpels, one, two, five, or indefinite. If both calyx and corolla are present, they commonly differ in texture and colour, the outer whorl being green, leaf-like, and often hairy externally, the inner commonly delicate and coloured. In a fossil state dicotyledonous angiosperms are not certainly known below the middle of the Cretaceous system. The class is divided into the three sub-classes *Incompletæ*, *Gamopetalæ*, and *Polypetalæ*. The largest Natural orders among dicotyledons are the *Compositæ*, *Leguminosæ*, *Rubiaceæ*, *Euphorbiaceæ*, and *Labiatæ*. [Monocotyledons.]

Dictator, in Roman history, a special magistrate instituted, usually for six months, by one of the consuls in accordance with a resolution of the Senate, whenever the situation seemed to demand the suspension of the constitutional checks on the supreme power, as at great military crises. The traditional account gives the first case as in 501 B.C. These dictators were technically appointed "to carry on affairs" (*rei gerundæ causa*). The other magistrates continued in office meanwhile as their subordinates. A vice-dictator or "master of the horse" was always appointed with, and selected by, these dictators. Occasionally, however, when the consuls were absent, dictators were appointed to preside at elections or perform special acts which were beyond the legal competence of the inferior magistrates. No dictator existed between B.C. 202 and 82, but the consuls in the case of need were invested with dictatorial power. In 82, however, Sulla, quite irregularly, caused himself to be appointed dictator to reform the Constitution. Julius Cæsar's similar appointment was also quite irregular. (A magistracy with the same name existed in many Italian towns in early times, and in the cities of Greece an "æsymnetes" was often appointed during civil strife with power to reform the Constitution.) The office was formally abolished soon after Cæsar's death. The title has often been adopted by revolutionary leaders, especially in S. America.

Dictys of Crete was the companion of Idomeneus at the siege of Troy. A MS., said to have been a translation from a work of his, a *History of the Trojan War*, was very popular in the Middle Ages. According to some it was written about 300 A.D., while others place it earlier; but there is no positive evidence as to its date.

Dicyemidæ, a family of Mesozoa, the supposed group of animals intervening between the Protozoa (or unicellular) and Metazoa (or multicellular animals). Each Dicyemid is composed of two parts, a head (or calotte) and a body. There is no differentiation of the cells into two layers separated by an intermediate mesoglœa or mesoderm. There are, however, some germ cells in the large original interior or "endoderm" cell; these may represent the intervening layers. All the supposed Mesozoa are parasitic, and it is therefore most likely that they are degenerate Metazoa; the question is, however, a difficult one, and is at present unsettled. The Dicyemidæ are all parasitic on Cuttlefish.

Didactic Poetry (Greek *didasko*, I teach), poetry professing to convey instruction on some subject, as the *Georgics* of Virgil on agriculture, and usually also having a certain moral significance.

Didelphia, a subdivision of Mammalia, containing the Marsupials (q.v.).

Didelphys. [Opossum.]

Diderot, Denis (1713–1784), a French writer and philosopher born at Langres in Champagne. He was educated at a school of the Jesuits, and at the Parisian Collège de Harcourt. In 1745 he published an *Essai sur le Mérite et la Vertu*, and *Pensées Philosophiques* in 1746. This was more or less an attack upon Christianity, as were also *Lettres sur les Aveugles à l'usage de ceux qui voient*. In consequence of these writings he was imprisoned in Vincennes. He tried writing for the stage, but this was a failure. In 1749 he collaborated with D'Alembert to produce the Encyclopædia, for which he wrote upon art, mechanics, history, and philosophy, and revised the work generally. The work was a financial failure, but the Empress Catherine of Russia came to his aid, buying his library and giving him a pension. In 1773 he made a journey to St. Petersburg to thank the Czarina, and after his return to France he lived in retirement. Of his many works some were published after his death. A philosophic dialogue called *Le Neveu de Rameau* was translated by Goethe. He wrote an *Essai sur la Peinture*, *Paradoxe sur le Comedien*, and two tales, *La Réligieuse* and *Jacques le Fataliste*.

Dido, or Elissa, a daughter of Belus, king of Tyre. According to the legend, when her brother, Pygmalion, murdered her husband, Sichæus, for the sake of his wealth, Dido, with a party of Tyrians who sympathised with her, fled with a treasure, and founded Carthage about 800 B.C. She obtained a grant of land by a stratagem. She was promised as much land as a bull's hide would cover, and she cut the hide into fine strips and thus made it encompass a goodly amount of land. One account represents her as burning herself upon a funeral pyre to escape the necessity of marrying the king of the Gætulians. Virgil relates her adventure with Æneas and her suicide when he deserted her.

Didot, the name of a great printing, bookselling, and type-founding house of Paris. The founder of the house was François (1689–1757). François-Ambroise (1720–1804) invented new processes and machinery in type-founding. Pierre-François (1732–1795) was a noted bibliographer. Pierre (1761–1853) succeeded his father in the management of the business, and brought out a magnificent folio edition of the classics. Of these the best known are *Virgil* (1798) and *Racine* (1801). He also made many improvements in mechanical processes, and was an author. Firmin (1764–1836) was the brother of Pierre, and took charge of the type-founding department. Among other inventions he introduced a new script and improvements in stereotyping. Ambroise-Firmin

(1790–1876) and Hyacinthe-Firmin (1794–1880) were also members of the house, which is one of the most universal and most widely known institutions of Paris.

Didymium, a rare metal (at. wt. 143, sp. gr. 6·5), which occurs in certain rare minerals as cerite, gadolinite, and orthite. It was discovered by Mosander in 1842, but later work has shown that it probably consists of two closely allied metals.

Diefenbach, JOHANN FRIEDRICH (1792–1847), a German surgeon, born at Königsberg. After studying at Bonn, Paris, and Berlin, he settled at Berlin, where he soon obtained the reputation of a good operator. He was noted for his success in making artificial noses, eyelids, and the like, and for his cures of stammering, squinting, and other defects.

Diego Garcia, an island of the Indian Ocean, in lat. 7° S. and long. 72° to 73° E. It is 30 miles long, and its bay is a useful coaling station. Population 700. The isle is a dependency of Mauritius.

Diegueños, a term applied by the Spanish missionaries to all the Indian tribes of the S. Diego district, south-west California. Here the chief groups are the Kizh, Netela, and Kechi, all of whom appear to be outlying branches of the great Shoshone [SNAKE] family.

Dielectric, in *Electricity*, is any medium that resists the passage of electric quantity. By so resisting, the medium is in a state of strain. It may be fractured if its thickness is sufficiently small or the stress sufficiently great. Dielectrics are important as insulators to localise electricity in definite regions or to localise its line of flow from place to place. Air, glass, ebonite, guttapercha, indiarubber, solid paraffin, and sulphur, are examples of good dielectrics. A vacuum also behaves well in that capacity. [INSULATION.]

Diepenbeck, ABRAHAM VAN (1607–1675), a Flemish painter, born at Bois-le-Duc. He appears to have begun as an engraver, and a plate of his, dated 1630, shows great power. In 1632 he was at Paris, and, with some fellow-pupils, took part in the pictures painted by Rubens in the Luxembourg Gallery. After travelling in Italy, he returned to Antwerp in 1635, and painted windows in the cathedral and in the Dominican church, and also for the church of St. Gudule at Brussels. In 1636 the Antwerp authorities gave him the freedom of the city, and he entered the studio of Rubens. Shortly after he was invited to England, where he painted several portraits, among them that of Charles I. In 1652 he returned to Flanders, and then devoted himself chiefly to the painting of religious subjects. Among his works, *St. Norbert giving the Blessing*, now at Deurne, near Antwerp, shows great wealth of colouring, as does a *Rape of Ganymede*. Berlin, Dresden, and Vienna possess paintings of his. He died head of the Antwerp Academy.

Dieppe, a French town in the department Seine-Inférieure, at the mouth of the river Arques, 93 miles N.N.W. of Paris. The name is possibly connected with the English *deep*, and once the town was the chief port of France. The revocation of the Edict of Nantes in 1685 did much to damage it, and the claims of the rival port of Havre gained the upper hand. Of its buildings, the thirteenth-century church of St. Jacques, built with stones brought from England; that of St. Rémi, built in 1522; and the old fifteenth-century castle, now barracks, are notable. On the west is the suburb La Barre, and on the opposite side of the harbour is the fishing quarter La Follet. The port admits vessels of 1,200 tons, but not at low water; and it is well known to English travellers as the point of communication with Paris by way of the Brighton and South Coast Railway and Newhaven. The town is well frequented as a watering-place and bathing-place; and the ivory manufactures of Dieppe have a great reputation. There are also saw-mills, horn and bone works, lace manufacture, and sugar-refineries, and much shipbuilding. There is also considerable fishing, and a good foreign trade. Quebec, in Canada, was founded by Dieppois.

Diet. [FOOD.]

Diez, FRIEDRICH CHRISTIAN (1794–1876), a noted philologist of the Romance dialects, for which he has done much the same work as Grimm for the German dialects. He lectured at Bonn, and became a professor in 1830. His best-known works are *Poetry of the Troubadours*. a *Grammar of the Romance Languages* (1836–1842), and his *Etymological Dictionary* (1853).

Difference, of two numbers, is the result obtained by subtracting the smaller from the greater, and similarly for any two quantities of the same kind. The difference of two physical quantities is often of more importance than the actual value of either; the difference of height of two points, for example, or the difference of electric potential, being frequently required when the absolute height or absolute potential are not wanted. In pure mathematics the law regulating a series of numbers may be derived by obtaining the successive differences between first and second, second and third, and so on. Thus the series representing the squares of the natural numbers is

0, 1, 4, 9, 16, 25, ...

The successive differences are

1, 3, 5, 7, 9, ...

The differences of these again are

2, 2, 2, 2, 2, ...

and we thus come to a stop, for there is no more complexity in the series. In this way we may gauge the complexity of a series by the number of times that successive differences are to be taken. In the case of the cubes of the natural numbers we have

	0	1	8	27	64	125 ...
First differences	1	7	19	37	61	...
Second differences	6	12	18	24	...	
Third differences	6	6	6	...		

On these considerations is based a calculus of differences, by means of which the summation of

such series may be effected and other dependent problems solved. It is of considerable importance in statistical work, and in the approximate determination of areas, etc.

Differentiation, in *Mathematics*, is the process of finding the magnitude of the change in a definite quantity, that is brought about by a small change in another quantity upon which the first is dependent. These small changes are called *differentials*, the general study of which is undertaken by the differential and integral calculus. [CALCULUS.]

Difflugia, a genus of Rhizopoda (q.v.) belonging to the family *Arcellina* (q.v.), common in the stagnant water in ponds and ditches. It consists of a small amœboid mass enclosed in a shell or carapace composed of grains of sand cemented together by a membranous secretion. There is an aperture at one end of the cell, and through this the finger-like processes or "pseudopodia" are extruded. The animal is little more than an Amœba (q.v.) protected by a layer of sand grains, and with the pseudopodia restricted to a single area. *D. proteiformis* is a common English species.

Diffraction, in physical *Optics*, is that phenomenon exhibited by light-waves, of being deflected out of their rectilinear course when striking against the edges of obstacles. On account of the wave-lengths of light being extremely small, diffraction is not very pronounced; with waves of sound in air the analogous effects are much more marked, the sound-waves being much longer. Newton's great objection to the wave-theory of light was that light did not behave in the same way as other wave-motions, in travelling round corners, etc. Diffraction shows that it does behave in the same way, and that Newton's objection was therefore invalid. [LIGHT, WAVE-THEORY.]

Diffusion, in *Physics*, is that property possessed by the particles of liquids and gases, of travelling from place to place by reason of the energy with which they are endowed. In a boiler, where steam at a high temperature is enclosed in contact with water at the same temperature, the particles are endowed with sufficient energy to pass incessantly from any one part of the enclosure to any other, whether from the liquid to the gas or back to the liquid again. In a glass of water that is apparently motionless the particles are continually, though slowly, moving from place to place in the body of the liquid; and though opposed in part by the skin-like action of the surface of the water, they continually effect a passage into the surrounding air and probably an occasional return to the liquid. The fact that diffusion actually occurs is more readily shown by the use of two liquids of different colours. Graham poured a strong solution of bichromate of potash along the bottom of a glass cylinder half filled with water, so carefully as to avoid mixing the liquids. Though the lower had the greater density, it was found that the sharp line of separation of colourless water from the deep red potash salt solution gradually became indistinct, and traces of colour appeared higher and higher in the cylinder of water until uniformity of tone and constitution was reached. This proved that particles of the heavier liquid had in opposition to gravity risen into the lighter medium above, and that the lighter water particles had similarly descended.

Digby, SIR KENELM (1603–1665) an English knight, was educated at Oxford, and when Charles I. became king, was appointed gentleman of the bedchamber, a governor of the Trinity House, and a commissioner of the navy. He fitted out an expedition against the Algerines, then became a Catholic, and from 1638–43 was in prison as a Royalist. He then retired to the Continent until the Restoration, when he returned to England and became a member of the Royal Society.

Digby, HON. ROBERT, British admiral, was born about the year 1733. In 1759 he participated in Hawke's glorious victory over M. de Conflans. In 1778 he shared in Keppel's action with d'Orvilliers, and in the following year was promoted to be rear-admiral. In 1779 he was appointed second in command of the fleet which, under Rodney, defeated De Langara off St. Vincent, and relieved Gibraltar. He subsequently held chief command in North America. He died in 1814.

Digestion. The food which is taken into the mouth consists of substances of varied composition, which are classified as follows: Proteids, fats, sugars, starches, mineral salts, and water.

Protcids are substances containing the elements carbon, oxygen, nitrogen, hydrogen, with a little phosphorus and sulphur. Most proteid substances are non-diffusible, *i.e.* they will not pass through animal membranes. (The particular group of proteids called peptones are, however, an exception to this rule.) The myosin of muscle, the albumin of white of egg, the gluten of bread, and the casein of cheese are examples of proteid substances.

Fats contain the elements carbon, hydrogen, and oxygen, the two last-named elements not being in the same proportions in which they are found in the case of water (H_2O). Fats, chemically considered, are compounds of glycerine with a fatty acid; they do not readily pass through animal membranes, but are convertible, under certain conditions, into soluble soaps, which do so readily.

The *sugars* and *starches* are often grouped together, and called carbohydrates. A carbohydrate is a substance containing carbon, hydrogen, and oxygen, the hydrogen and oxygen being present in the same proportions in which they are found in water. The sugars are diffusible substances, the starches are non-diffusible.

The structure of the wall of the alimentary canal presents certain peculiarities in different situations, but, generally speaking, the outer tunic or tunics are composed of unstriped muscle, while internal to these is the mucous membrane, and between the two is what is called the submucous coat.

On the internal aspect of the mucous membrane there is always found (from the œsophagus to the anus) a single layer of columnar epithelial [EPITHELIUM] cells. In the mucous membrane ramify innumerable capillaries, and diffusible substances

readily pass from the digestive tract into these capillaries. Moreover, the mucous membrane is beset with glands, the secretions of which pass into the alimentary canal and mix with the food contained therein.

The bulk of the food undergoes absorption in the alimentary canal—that is to say, it finds its way into the capillaries which ramify in the mucous membrane. Only about one-tenth of the dry solid matter ultimately remains unabsorbed. The process of absorption is facilitated by the conversion of the non-diffusible constituents of the food into diffusible substances, this conversion being brought about by the various digestive juices secreted by the glands and poured from them into the alimentary canal, where they mix with and act upon the food.

Thus, by the action of these secretions, or digestive juices, non-diffusible substances in the food are converted into diffusible substances. These diffusible substances find their way into the network of capillary blood-vessels which exists in all parts of the mucous membrane, and so into the portal system of blood-vessels, whence they are conveyed by the portal vein to the liver, and so reach the general circulation. The absorption of nutrient materials from the alimentary canal is not entirely a question of diffusion through an animal membrane—that is to say, it is not purely a physical process. To this matter, however, it will be necessary to return.

It will now be convenient to consider the various parts of the alimentary canal, to allude very briefly to their structural peculiarities, and to discuss the several changes in the food brought about by the secretions proper to each.

In the mouth the food undergoes the process of mastication ; that is to say, the portions of food are broken up by the teeth and mixed with the secretions of the glands opening into the mouth until a " bolus," or pulpy mass, is produced, which is passed backwards by the tongue into the grasp of the muscles of the pharynx, which contract upon it and force it downwards into the œsophagus.

The secretions of the mouth comprise the mucus yielded by the buccal glands and the several salivary secretions. The latter are produced by the salivary glands (q.v.), parotid, submaxillary, and sublingual, which are arranged in pairs, so that there are six salivary glands in all. These glands elaborate the saliva, and discharge it through their ducts into the mouth, where it is mixed with the food.

The saliva is a very watery secretion (994 parts of water in 1000 parts) ; it contains, however, a substance ptyalin, which possesses the property of converting starch into sugar. Only a small portion of the starchy elements of the food, however, are converted into sugar in the mouth.

The bolus of food passes down the œsophagus (q.v.), or gullet, and reaches the stomach (q.v.).

In the stomach two kinds of glands are present. The one kind (cardiac or peptic glands) is the more numerous, and is found throughout the whole mucous membrane of the stomach, excepting the portion near the pylorus. The other kind (pyloric glands) occurs in the neighbourhood of the pyloric orifice of the stomach. The food remains for some time (ten minutes to two hours or more) in the stomach, and becomes thoroughly mixed with the secretion of the glands of the stomach, which is called gastric juice. The muscular walls of the stomach contract, and cause the contained food to be thrown into movement and to be broken up and dissolved in the gastric secretions. The pyloric orifice is closed by a band of muscular fibres which surround it—the sphincter of the pylorus, as it is called. From time to time this sphincter relaxes and allows the contents of the stomach to escape into the small intestine. The material which thus escapes is of the consistence of thin gruel, and is called *chyme*. The gastric juice is mainly derived from the cardiac or peptic glands. It is acid in reaction (the acidity being due to free hydrochloric acid), and contains a substance called pepsin. Pepsin possesses the property of converting non-diffusible proteids into diffusible peptones. The peptone formed partly diffuses through the mucous membrane of the stomach and reaches the capillary network of the gastric mucous membrane.

Thus of the different kinds of food stuffs the proteids are those which are chiefly acted upon in the stomach. Starchy foods are unaffected. Sugars may be to a certain extent absorbed. Fats are broken up, the particles of fat being reduced to a fine state of subdivision, but they are not made diffusible. To the result of this process of breaking up of fatty substances the term emulsion is applied, and the fats are said to be emulsified.

At the commencement of the small intestine two important secretions are mingled with the food, namely, the bile and the pancreatic juice. The bile (q.v.) is alkaline, and the further processes of digestion which occur throughout the small intestine are carried on in an alkaline and not as in the stomach in an acid medium.

Moreover, the bile possesses the property of emulsifying fats.

The functions of the pancreatic juice are very important. In the first place it converts starches into sugars ; secondly, it acts upon proteids, converting them into peptones (and more than this it decomposes further some of the peptone with the formation of bodies known as leucin and tyrosin) ; thirdly, it emulsifies and saponifies fats. The pancreatic juice thus acts upon the three kinds of non-diffusible food stuffs (viz. proteids, starches, and fats), converts them into diffusible material, and so facilitates their absorption.

The structure of the small intestine may be briefly alluded to ; the mucous membrane is thrown into folds called *valvulæ conniventes ;* these folds secure the thorough admixture of the secretions with the liquid intestinal contents, and, moreover, offer a largely increased extent of mucous surface for secretion and absorption. The glands of the small intestine are of three kinds—Brunner's glands in the duodenum, the crypts of Lieberkuhn, which occur throughout both large and small intestines, and the lymphoid glands. Little is known concerning the secretion of the two former kinds of glands. The lymphoid structures either occur singly (*glandulæ solitariæ*) or in patches (*glandulæ agminatæ*). The latter are also called Peyer's

patches ; they are limited to the lower six feet of the small intestine.

A remarkable and characteristic element of structure in the small intestine is the *villus*. Each villus is a projection of mucous membrane $\frac{1}{50}$ inch or thereabouts in length, containing capillaries, unstriped muscular fibres, adenoid tissue, and a central lymph channel or lacteal. The villi being closely set, give a velvety appearance to the surface of the intestinal mucous membrane as seen

MUCOUS MEMBRANE OF THE SMALL INTESTINE OF THE DOG.
(*Showing villi and glands.*)

with the naked eye. The figure shows the appearance presented by a thin section through the small intestine of a dog when viewed under a magnifying power of some 60 diameters, the projections being the villi. The richness of the blood supply to these villi is seen in the adjoining figure, which shows

VILLI OF THE SMALL INTESTINE OF THE MOUSE.
(*The blood-vessels are artificially injected.*)

the appearance presented by a similar section through the small intestine of the mouse, in which the capillaries have been filled with injection material, in order to make their presence and arrangement obvious. The central lacteal (not shown in either figure) serves for the conveyance of fatty matter. Each central lacteal is, in fact, in direct communication by a system of lymph channels with the thoracic duct, and this duct receives the contents of the several lacteals, and passing upwards in front of the vertebral column through the abdomen and thorax, ultimately empties itself into the junction of two large veins in the neck. The material which thus finds its way from the villus through the lacteal into the thoracic duct, and which finally is discharged into the veins of the neck and so reaches the general circulation, is called chyle.

Chyle is a milky fluid which contains fat in a finely divided state. The exact way in which these fatty particles find their way into the lacteal is not known. The villus, like all the rest of the mucous membrane of the small intestine, is lined by columnar epithelium, and hence the particles of the chyle, in order to reach the central lymph vessel of the villus, must somehow pass this wall of epithelium.

From what has been said it will be seen that the elements of the food which pass into the blood and serve for the nutrition of the body pursue one of two courses. Either they are taken up directly by the capillaries of the portal system and conveyed by the portal vein to the liver, after passing through which they reach the general circulation ; or they are taken up by the lacteals and conveyed by the thoracic duct into the venous system and so reach the general circulation. Diffusible peptones, sugars, and saponified fats pursue the former course, while the main constituents which enter the lacteals are, as already stated, fats which have been reduced to a fine state of subdivision.

The intestinal contents during their passage through the large intestine do not undergo changes of importance comparable to those which occur in the small intestine. In fact the main alteration is the acquirement of a semi-solid consistency.

All the assimilable substances having been taken up by the processes of absorption, the waste or non-utilisable elements of the food leave the body as fæces.

Digit (Lat. *digitus*, the finger), any number under ten ; in astronomy, one-twelfth of the diameter of a disc, *e.g.* of the earth or the moon.

Digitalin, the physiologically active constituent of the foxglove—*Digitalis*. Various investigators, employing different methods, have obtained compounds from the foxglove leaves or seeds, possessing a bitter taste and poisonous properties. These various compounds, all of which have been called *digitalin*, are probably compounds of the essential active principle, which has not been prepared pure, with different substances.

Digitalis. The official preparations of this important drug are an infusion (dose 1 to 4 fluid drachms) and a tincture (dose 5 to 30 minims). Digitalis is of very great service in certain forms of heart-disease ; it is also employed to increase the amount of the urinary secretion, and is said to be of value in checking hæmorrhage. [FOXGLOVE.]

Digitigrada. [CARNIVORA.]

Dijon, a town in eastern France. formerly the capital of Burgundy, now the *chef lien* of the Côte d'Or department, is situated on a fruitful plain which is bordered by slopes covered with vineyards. The old ramparts have been converted into boulevards, and the town is protected by a chain of outlying forts. The town is at the junction of the Ouche and the Suzon, and is also on the Burgundy Canal. The view of the city from the neighbourhood is picturesque, and it seems to bristle with spires of every style and date. Many of the buildings date from the time at which Dijon was the Burgundian capital. The cathedral is large, and has a wooden spire of 300 feet in height. The churches of Notre Dame and of St. Michael are notable, as is the old palace of the Dukes of Burgundy, now used as town-hall and museum. The Palais de Justice was formerly the seat of the Burgundian parliament. There is a fine and interesting museum, and the town has good schools and colleges. There is a large wine trade, especially in Burgundies, and there are manufactures of woollen, hosiery, paper-hangings, candles, mustard, chemicals, machinery, as well as cotton and oil mills, foundries, and tanneries. Marcus Aurelius is said to have established here a *Castrum Divionense*, and Dijon has played an important part in later history. It came into the possession of France upon the death of Charles the Bold in 1477, and it was the scene of fighting in the Franco-German war both in 1870 and 1871. Charles the Bold and Bossuet were born at Dijon.

Dilapidations, want of repairs required to a house during the tenancy or at its expiration. The word has also a special significance in ecclesiastical law. The incumbent of a benefice is bound to keep the parsonage house and chancel of the church in good and substantial repair, restoring and rebuilding where necessary according to the original form. and where he neglects these duties, or commits waste on the timber or lands of the benefice, he is liable to be punished in the Ecclesiastical Court and to be compelled to restore the premises to a proper condition. He is also personally liable to an action at law by his successor in the benefice. By a statute passed in the present reign (19 and 20 Vic., c. 50) it is provided as to advowsons vested in (or in trustees for) inhabitants or other persons forming a numerous class and deriving no pecuniary advantage therefrom, that the same may be sold by order of such persons, and the proceeds applied to the beneficial purposes therein specified, and which include the erection of a parsonage house if there be none, or the rebuilding, repair, or improvement of any parsonage house then already existing.

Dilem, a large and powerful branch of the Arab bedouins, on the east bank of the Euphrates, in the province of Baghdad, coterminous southwards with the Beni Laam bedouins, and ranging eastwards as far as the Persian frontier; twelve main branches—Al Mahamdeh, Al Duweb, Abu Shab, Kistan, Abu Aabed, Abu Alwan, Al Janabin, Abu Rakebah, Abu Faraj, Abu Diyab, Abu Assaf, and Abu Nimr; there are over 20,000 tents, and about 10,000 fighting men.

Dilettante (Ital. from Lat. *delectare*, to delight), a patron of art, an amateur: often used in a half-contemptuous sense. The "Society of Dilettanti," however, which was founded in 1734 to promote the taste for ancient classical art in England, has done excellent service by facilitating exploration and by the publication of drawings of relics of ancient Greek art.

Dilfan, a large section of the Kurds of Luristân, West Persia, appear to be the true aborigines of this region, and are regarded as such by the rest of the population, who call them Leks or Laks, and who look upon themselves as more recent immigrants from the north-west. The Dilfans, who are certainly of Kurdish stock and speech, still maintain the tribal organisation, and, like the neighbouring Bakhtiari, are divided into a large number of clans. Chief divisions—*Mumuvend*, with twelve branches, including the Bijâvend, Bavâli, and Hindi (gypsies); *Kâkâvend*, with five branches; *Ivetîvend*, with ten branches; *Ainevend* or *Chevâri*, with four branches (A. H. Schindler, *Reisen im Sud-westlichen Persien*, 1877–78). The tribal ending *vend* has been identified by Rawlinson with the Cuneiform *manda*, a dialectic variety of *mada*, whence *mede*, and the Dilfans seem to be direct descendants of the ancient Medes. of whom the Kurds (the Karduchi of Xenophon) were a main division.

Dilke, Charles Wentworth (1789–1864), an English journalist and critic, born in London. He was educated at Cambridge, and employed in the Civil Service. From 1830 to 1846 he was proprietor and editor of the *Athenæum*, and in the latter year he established the *Daily News*, which he edited for three years. Among his works were six volumes of *Old English Plays*, and many of his papers have been edited, together with a biographical sketch, by Sir Charles Dilke, grandson of the author.

Dilke, Sir Charles Wentworth (1810–1865), son of the above, was born in London, and educated at Westminster and Trinity Hall, Cambridge. He took an active part in the promotion of the Great Exhibition of 1851, as also in that of 1862, for his services to which he was created baronet. In 1865 he represented Wallingford in Parliament; he died in 1869 at St. Petersburg, whither he had gone as English representative at an agricultural exhibition.

Dilke, Sir Charles Wentworth, born 1843, is the son of the last-mentioned. After studying at Trinity Hall, Cambridge, he was called to the bar, and then travelled through the United States and the chief British colonies, embodying his experiences in his work *Greater Britain* (1868). In the same year he entered Parliament as an advanced Liberal, and held office twice. In 1886 he was defeated at Chelsea, and shortly afterwards retired into private life, but returned to Parliament at the election of 1892. He is a very high authority on Colonial and European politics, and military matters. His second wife was the widow of Mark Pattison, late Rector of Lincoln College.

Dill. Dill water is a remedy which has a considerable reputation in the treatment of digestive disturbances in young children.

Dill (*Anethum graveolens*), an umbelliferous plant, native to Africa and Southern Europe, but cultivated to a small extent in dry soil and sheltered spots in England. It resembles fennel, having decompound leaves, no involucre, yellow flowers, and oval fruits. These last yield dill-water and oil of dill, and are used in gin-distilling.

Dillmann, CHRISTIAN FRIEDRICH AUGUST, a great German Orientalist, born at Illingen, a village of Wurtemberg, in 1823. After studying at Tubingen under the celebrated Ewald, and after travelling in England and France, he occupied chairs of Oriental languages successively at Tubingen and Kiel, and in 1864 became professor of Old Testament exegesis at Giessen. He is a great authority on Ethiopian, a language that had been much neglected, and which he considers the fourth in importance among the Semitic dialects. He has written many works, the majority of them bearing upon Ethiopian.

Dillon, JOHN, an Irish patriot and parliamentary representative, born in New York in 1851. His father was a prominent member of the Young Ireland party, and was M.P. for Tipperary at the time of his death. The son was educated at Dublin, and sat as Nationalist member for Tipperary 1880–1883, and later as member for East Mayo. His participation in the "Plan of Campaign" has cost him four imprisonments.

Diluvium, an almost obsolete term in geology, formerly applied to the boulder-clays (q.v.) and other deposits which are now known to be more or less directly due to the action of the ice of the Glacial Period (q.v.), because their usually unstratified condition suggested that they were the relics of a deluge.

Dimensions, in *Geometry* and *Physical Science*, relate to the degree in which fundamental units are involved in the formation of derived units. In pure geometry, for instance, the chief entities involved are points, lines, areas, and volumes. A standard unit of length exists from which are derived units of area and volume; thus starting with a length of one inch we derive the square inch for areas and the cubic inch for volumes. Whence we say that the dimensions of volume, *so derived*, involve the cube of a length, or that a volume has three dimensions. It is incorrect to speak of space as tridimensional. Concerning the much discussed question as to the existence of a fourth dimension in space, little need be said; its interest is at present purely speculative, and it can only be demonstrated that geometrical entities of four dimensions are not impossible. It may here be pointed out that the extremities of a line are points, which have no dimensions; the extremities of an area are lines, of one dimension; and that of a volume the extremities are areas, of two dimensions. A four-dimensioned figure should apparently be bounded by a three-dimensioned figure, *i.e.* by a volume. In the theory of dimensions as applied to physics a great deal remains to be investigated. As an example of a derived unit we may take that of speed. We obtain the speed of a body by dividing the length traversed by the time taken to do so. Thus speed is of the nature of length divided by time; its dimensions are then $L \div T$. Certain measurable quantities may be differently defined and may have different dimensions according to the definition. Thus a quantity of water may be expressed by its volume or by its mass; these two are totally different, but a relation exists between the two expressions for the same physical quantity. This is of special importance in the case of electrical resistance, which has been defined in two ways. If any special resistance is estimated in terms of the two different units so obtained, a physical constant is found to exist in the ratio between the two numbers. That this constant is closely identical with the speed of propagation of light is the basis of Clerk Maxwell's electro-magnetic theory of light.

Dimorphism. 1. Certain minerals and chemical substances possess the property of crystallising in two or more distinct forms. When two forms occur the substance is said to be *dimorphous*, and the phenomenon is known as *dimorphism;* in the case of three forms, it is *trimorphous*, or the general term, *pleomorphous*, may be applied. Thus sulphur crystallises in either rhombic crystals or monoclinic (crystallography); it is hence dimorphous. Calcium carbonate is also dimorphous, existing both as *calcite* and *aragonite*. The oxide of titanium is an example of a trimorphous body, occurring in the three forms known as *rutile*, *anatase*, and *brookite*.

2. Different individuals of the same species often present very dissimilar form and structure. This is known as dimorphism, a phenomenon of which there are three main varieties, viz. seasonal, sexual, and functional. Seasonal dimorphism is best shown in regions which have a much greater difference between the summer and winter climates than in our temperate country: good illustrations are afforded by the annual change in colour of many northern animals, such as the Arctic fox, the Scandinavian grouse, etc., which are brown in summer and white in winter. Sexual dimorphism is more frequent; the differences between the peacock and the peahen, the lion and the lioness, the horned ram and hornless ewe, the occurrence of antlers among deer and reindeer only in the male, etc., are all cases of this variety. The differences between the two dimorphic forms in these cases are, however, insignificant when compared with those which occur among invertebrates; perhaps the most striking of these are met with among the Cirripedia (q.v.), where the male is a dwarfed form, very imperfectly developed, and which lives only to fertilise the female. A very familiar case among Invertebrates is that of the Bees (q.v.), where there are two kinds of females—the barren workers and the fertile queen bees. Functional metamorphism is probably the most important; it occurs mainly among colonial animals. The Bryozoa afford good illustrations

both of colonial and individual dimorphism; in the former it may be due directly to the action of the environment on the growing colony. Thus one species of Bryozoa may occur in the "Lepralian" form, as a mere crust over shells or stems; or it may rise into foliaceous frond-like expansions in the "Escharine" form, or it may form cylindrical branching shoots in the "Vincularian" form. In addition to this the individual zooids of the colony may exhibit functional dimorphism. Thus some zooids may be modified into the prehensile organs known as "avicularia," others into locomotor organs as vibracula, others into ovicells (marsupial pouches), and others into stems or root fibres. In cases where there are so many modifications, the phenomenon is generally referred to as "polymorphism." Another good illustration of this is afforded by the Siphonophora (q.v.) where the float or pneumatophore, the protective bracts or hydrophyllia, the rectocalyces, etc., are all dimorphic, or rather polymorphic, forms of one type of polypite. [HETEROGONY.]

Dimyaria, the group of Lamellibranchs including all those bivalve shells the valves of which are closed by a pair of muscles. It includes the two orders Isomya (q.v.) and Heteromya (q.v.); in the former the two muscles are approximately equal, as in the Venus shells, the Arcas, etc.; in the latter, the anterior adductor is much the smaller, as in the mussels.

Dinajpur, a Hindustani town of Bengal, 205 miles N. of Calcutta, and capital of a district of the same name. The district is about 4,118 square miles in extent.

Dinan, a French town in the department Côtes-du-Nord (Brittany), on the Rance, 14 miles S. of St. Malo, is prettily situated on a steep hill, 200 feet above the river, and is surrounded by old walls, now mostly ruined. Some of the monuments of Dinan are historically interesting, among them being St. Saviour's church, which contains the heart of Bertrand du Guesclin, the fourteenth-century castle of the Dukes of Brittany—now used as a prison—with the tower of Queen Anne, with its chapel containing Duchess Anne's easy chair. A saline hot spring, and the chateau of La Garaye, celebrated by Mrs. Norton, are in the neighbourhood.

Dinant, a Belgian town in the province of Namur, and 14 miles S. of it, on the Meuse, its situation having that picturesqueness which is characteristic of the riverside towns of the Belgian Ardennes. The place is important in the new scheme of frontier defence, and has borne its share in the wars of the past. The town is noted for its gingerbread (gâteau de Dinant). The town hall was once the palace of the Princes of Liège.

Dinapore, a town in Hindustan in the Patna district of Bengal, on the right bank of the Ganges, and about 12 miles N.W. of Patna. The town is the headquarters of a military district, and there are large barracks and cantonments.

Dindigal, an Indian town in the Madura district of the Madras Presidency, having a fort upon a height. The town is pleasantly situated at the end of a fertile valley.

Dindorf, WILHELM (1802–1883), an eminent German classical scholar. He was born at Leipzig; there he spent the greater part of his life, which he devoted almost entirely to Greek literature, and there he died. His chief works were editions of the Greek dramatists and comments upon them and other writers. His brother Ludwig shared some of his work.

Dingo (*Canis dingo*), the Australian wild dog, probably introduced before the discovery of the island by Europeans. It is a handsome animal, about the size of a shepherd's dog, with tawny fur, a flat, elongated head, and bushy fox-like tail. Their temper is fierce, but when taken young they can be tamed, and have been domesticated by the natives. They prey on sheep, and, though their numbers have been greatly reduced in South Australia, a reward of five shillings is still paid for killing a wild dog.

Dinoceras, the type genus of an extinct suborder of huge herbivorous Ungulata (q.v.) discovered in 1870 in Eocene rocks in Wyoming by Professor O. C. Marsh. Seven species have been described. They had five toes on each foot; the femur and tibia in a straight line, as in the elephant; somewhat elongated nasal bones, but apparently no proboscis; three pairs of rounded horn-cores, which probably had horny sheaths; the upper canines prolonged into powerful tusks. the points of which rest against an expanded margin of the lower jawbone; and a remarkably diminutive brain-cavity. They equalled the elephant in size.

Dino flagellata, a subclass of the Mastigophora (q.v.), a class of the Protozoa. In this group the animal is provided with two or more flagella, of which both may be at the anterior pole as in the order Adinida, or one may occur at the pole while the rest are lodged in lateral furrows, as in the order Dinifera. The whole of the animals in this subclass are microscopic in size.

Dinornis, a genus of gigantic ostrich-like birds, related to the little wingless kiwi or *Apteryx* of New Zealand, but reaching a height of 10 or 11 feet. The egg of one kind is 10 inches long. Some 20 species occur in Pleistocene deposits and caves in New Zealand, where they are known to the Maoris, by whom they were probably exterminated, as Moas. Skin and feathers have been found, and remains of the genus have also been discovered in Queensland.

Dinosauria, an extinct order or sub-class of reptiles, only known at present from Secondary rocks. They are very varied in size and form, some terrestrial, others aquatic or amphibious; some carnivorous, but the majority herbivorous. The vertebræ are flat or slightly concave, those of the neck numerous. The hind limbs are longer and larger, and with the bones of the pelvis present

striking resemblances to those of the ostrich-like birds. Some genera at least walked erect, their powerful tails assisting in balancing their bodies. Some have dermal bony plates or *scutes*, which are even in some cases prolonged into formidable spines, and others have spur-like processes on the fore-feet. The limb-bones are in some cases solid, in others hollow; and the teeth are serrated, pointed and recurved in the carnivorous, and worn flat in the herbivorous kinds. Some forms seem to have been furnished with horny beaks. Some of the three-toed footprints in the Triassic rocks of America belong to Dinosaurs; but the group apparently culminated in the Jurassic. From rocks of this age in Colorado, Marsh obtained *Atlantosaurus*, the thigh-bone of which is over 6 feet long, so that the whole animal is estimated to have been 80 feet long and 30 feet high, the largest land-animal known in any age. Marsh considers that the dinosaurs should rank as a subclass, and divides them into orders, of which the chief are the *Sauropoda*, *Stegosauria*, *Ornithopoda*, and *Theropoda*. The Sauropoda are herbivorous with nearly equal limbs, solid limb-bones, and five claws on each of the plantigrade feet. This order includes the least specialised and most crocodilian forms, such as *Atlantosaurus* and *Brontosaurus*, as well as the huge British forms known as *Cetiosaurus*. The Stegosauria differ in having very small fore limbs and osseous dermal armour, often spinous, as in *Scelidosaurus* from the Lias of Lyme Regis, *Polacanthus* and *Hylæosaurus* from the Wealden, and *Acanthopholis* from the Chalk. The Ornithopoda have small fore limbs with five digits each, hollow hind limb-bones, with only three or four toes to each digitigrade foot, and no teeth in the front of the jaw. This order includes the small arboreal or rock-climbing *Hypsilophodon* and the probably amphibious *Iguanodon* (q.v.). The Theropoda have small fore limbs, hollow limb-bones, digitigrade feet with prehensile claws and teeth indicating their carnivorous character. *Megalosaurus* and the Triassic *Thecodontosaurus* are among the best known European genera.

Dinotherium, a gigantic fossil proboscidian found in the Miocene beds of Hesse Darmstadt, France, Greece, and India. Its skull, measuring $4\frac{1}{2}$ feet in length and 3 feet in breadth, indicates an animal larger than the elephant. It has ten molar teeth in each jaw, and the lower jaw is bent downwards anteriorly and has two huge tusk-like incisors bent downward and backward.

Diocese (Greek *dioikēsis*, arrangement), originally a subdivision of a Roman province, *e.g.* of Cilicia under Cicero's government. The Roman empire, in its administrative reorganisation by Constantine, was divided into four large districts, called *dioikēseis*, which were subdivided into provinces. The ecclesiastical divisions followed the civil, each of these districts being under a patriarch, and the provinces under bishops. Later, but not before the fourth century, the word was transferred to single bishoprics. In England, also, the ecclesiastical divisions followed the civil originally, the Anglo-Saxon bishoprics being originally coincident with the several kingdoms. At present the dioceses are grouped in provinces, each under an archbishop (who also have special districts in which they perform ordinary episcopal functions), and subdivided into archdeaconries and parishes, which latter are grouped into rural deaneries. In the larger English dioceses the bishop is usually assisted by a suffragan. [BISHOP.] In the United States, each State was formerly a diocese of the Protestant Episcopal Church, but several have been subdivided. *Diocesan Conferences*, composed of clerical and lay members, have been held in most English dioceses annually since about 1850.

Diocletian, C. VALERIUS DIOCLETIANUS (45–313), a Roman, who, though of insignificant birth and a native of Dalmatia, was declared emperor by the army in 284 A.D. He fought in Mœsia, and conquered the Allemanni, and was a general favourite. He took to share the government with him M. Aurelius Valerius Maximus, and, later, C. Galerius and Constantine Chlorus. Of the four parts of the empire as thus divided Diocletian ruled Thrace, Egypt, Syria, and Asia. The great feature of his reign was the restoration of the power of the empire, which had been on the wane. Ecclesiastically, he is known as having sanctioned one of the persecutions of the Christians. In 305 he resigned his dignity, retired to Dalmatia, and dug his garden in peace. [SPALATO.]

Diodati, GIOVANNI (1576–1649), was born at Lucca of a noble Catholic family. He was professor of Hebrew and of theology at Geneva, and was a great friend of Milton, represented Geneva at the Synod of Dort, helped to draw up the Belgic confession of faith, and, with a view to advancing Reformation principles into Italy, made an Italian translation of the Bible. He died at Geneva.

Diodon. [GLOBE-FISH.]

Diodorus, called Siculus, because a native of Sicily, a historian of the time of Julius Cæsar and of Augustus. Having formed the project of writing a universal history, he devoted thirty years to the purpose, and travelled widely in Asia and Europe. His work was a history of the world from the beginning to the Gallic wars of Julius Cæsar. It was divided into three periods and 40 books, but of these books only 1–5 and 11–20, with some fragments, have survived.

Dicœcious, from the Greek *oikos*, a house, is the term applied to plants in which the two sexes are on distinct individuals. In many species of the wracks (*Fucus*) the antheridia and oogonia are on separate plants. Among mosses, plants are frequently exclusively male or female, as are the prothallia of most horsetails and some ferns. The heterosporous Pteridophyta bear two kinds of spores, macrospores producing prothallia which bear archegonia, and microspores producing prothallia which bear antheridia. In some flowering plants, such as willows and poplars, and the Aucuba, the carpels, or leaves bearing the ovules (macrosporangia) or female structures, are on distinct plants

from the stamens, or leaves bearing the pollen-sacs or microspores, the male structures.

Diogenes, commonly called the Cynic (412–323 B.C.), was a native of Sinope, in Pontus. His father was banished for coining, and the son accompanied him, going to Athens, where he was attracted by the fame of Antisthenes, and wished to become his disciple, and not even blows could deter him from his desire. From being an epicure and a sybarite, he advanced to the extreme of asceticism, but his tact enabled him to retain his influence over the Athenians. His principle seems to have been that the practice of self-government leads to every other good, but with him this self-government entailed contempt for everything that may distract the mind from the practice, including art and literature. On a voyage to Ægina he was taken prisoner by pirates and sold into slavery, and was bought by a Corinthian named Xeniades, who, won by his character, set him free, and made him tutor to his children. It was at this time, if ever, that his celebrated interview with Alexander the Great took place, having for result that Alexander said if he were not Alexander he would be Diogenes. Of the different stories told about him—for instance, his living in a tub—they may or may not be true: probably not, though Landseer leads us to believe that the tub-life was contemporary with the Alexander episode. Shakspeare seems to have embodied the popular idea of Diogenes in Apemantus.

Diogenes Laertius, the Greek author of a history of philosophy, was born at Laerte, in Cilicia, whence his name. Little is known about him personally, but it is probable that he lived about the second century A.D. His work is interesting as throwing light upon Greek life, and as preserving fragments of other writers which would have otherwise been lost. Many later writers of lives of the philosophers have drawn upon his stores.

Diomedes. 1. The son of Tydeus and king of Argos, was one of the suitors of Helen, and thus bound to take part in the expedition against Troy, of which he was one of the principal heroes. The protection of Pallas and his own bravery caused him to play a conspicuous part in the struggle, wounding Aphrodite and Ares and attacking Apollo, and finally being one of the inhabitants of the wooden horse. 2. A king of the Bistŏnes, who fed his horses on human flesh, and was killed by Hercules, who carried off the horses.

Dion of Syracuse was married to the daughter of Tyrant Dionysius the Elder, and had great influence over both the older and the younger Tyrant. He tried to reform the latter, and, being banished by his fellow-townsmen, he returned and made himself ruler of the city. In 353 he was assassinated.

Dion Cassius, a Greek historian, who has been described as the last of the old historians who knew the laws of historic writing, was born at Nicea 155 A.D., and was by the mother's side a descendant of Dion Chrysostomus (q.v.). His father was a Roman senator in the reign of Commodus, and the son became a senator and a prætor under Pertinax, and was appointed governor of Pergamos and Smyrna. He also commanded in Africa and in Pannonia, where he overcame a sedition of the Prætorians. Having fears for his life during the reign of Alexander Severus, with whom he was at first in favour, he obtained permission to retire to his native place, and here he composed a history of Rome from the time of Æneas to his own. Of the 80 books of which this consisted, 19 (36–54) remain, together with some fragments, and a later abridgment gives some idea of the rest. His style was pure, and his speeches at times recall those of Thucydides, but his history contains errors, and he showed credulity as well as injustice towards some of the great men of Rome.

Dion Chrysostomus (50–110), a Greek sophist and rhetorician, born in Bithynia. He studied eloquence and philosophy, and travelled to get a knowledge of men. He was free-spoken and stoical. In answer to Vespasian, who consulted him in Syria, he advised the restoration of the republic. To escape proscription under Domitian he went into voluntary exile and worked as a labourer, having for companions a dialogue of Plato and a speech of Demosthenes. At Domitian's death he was at a camp on the Danube, and harangued the soldiers in favour of Nerva, who in return advanced him. He was an intimate adviser of Trajan, and gained many privileges for his fellow-countrymen, who, however, treated him with ingratitude. His orations, 80 in number, are in good Attic Greek. There are four discourses upon royalty, in which he takes occasion to extol Trajan.

Dionæa muscipula (VENUS'S FLY-TRAP), the only known species of the genus, a plant belonging to the Droseraceæ or Sundew family, native to the swampy ground round Wilmington in Carolina, but now commonly grown in greenhouses on account of its great physiological interest. It has few root-fibres and a scape terminating in a cluster of white flowers, but its important structures are its leaves. These form a radical rosette, not large individually, and pale green in colour. They have winged petioles or adnate stipules and round blades with strong mid-ribs. Round the margin of the leaf are inflexed spinous "tentacles," like the teeth of a gin, and on the upper surface of each half of the leaf are numerous glands and three or four long multicellular hairs. On these hairs being touched by an insect or other nitrogenous body, the normal electric current in the leaf is reversed, as was demonstrated with the galvanometer by Professor Burdon Sanderson, and the two halves of the leaf instantly shut together, the mid-rib acting as hinge. The glands then pour out a copious acid digestive secretion, and the leaf remains tightly closed until the food captured is digested and absorbed.

Dionysius, ST., THE AREOPAGITE (Acts xvii. 34), according to tradition was one of the judges of St. Paul, when he appeared before the Areopagus. He was the first Bishop of Athens, and suffered martyrdom. The four treatises on *Celestial Hierarchy*, *Ecclesiastical Hierarchy*, *Divine Names*, *Mystic Theology*, ascribed to him, are probably

spurious and later in origin. He is sometimes confounded with the St. Denys who became the patron saint of France.

Dionysius the Elder (430–367 B.C.), Tyrant of Syracuse, was of obscure parentage, but became a general and commander-in-chief of the army. Owing to his influence with the army, he made himself head of the state at the age of 25. He extended the rule of the city over the other cities of Sicily, fought with the Carthaginians, and conquered them. He made an expedition to Lower Italy, and starved out Rhegium (387). After another short war with Carthage, he had a period of peace, and composed poems and tragedies, with which he contended at the Olympic games. In 368 he tried to drive out the Carthaginians, and was shortly after poisoned by his successor. Dionysius had three great objects in his policy—to make Syracuse supreme in Sicily, to drive out the Carthaginians, and to subdue the Greek cities of Lower Italy. The fortifications erected by him are still one of the sights of Syracuse.

Dionysius the Younger (367–343 B.C.) was chiefly noted for the excesses of his life. His brother-in-law and guardian Dion tried to reform him, and caused Plato to visit him more than once and exert his influence. But Dionysius banished Dion and confiscated his property. In 357 Dion made himself master of Syracuse, and Dionysius fled; but after the death of Dion he regained the power. Timoleon, who came from Corinth with aid against the Carthaginians, deposed him in 344. Dionysius went to Corinth, and is said there to have given lessons in grammar. He died in 343.

Dionysius of Alexandria, ST., died in 264, was a native of Saba. The reading of St. Paul's works led him to embrace Christianity, and he became a disciple of Origen. He was appointed Patriarch of Alexandria in 248, and was a determined antagonist of the Sabellian heresy. His works were much admired, but only fragments of them remain.

Dionysius of Halicarnassus (70–6 B.C.), a Greek historian, critic, and rhetorician, went to Rome 30 B.C. There he lived for 20 years, learning Latin and amassing materials for his history of Rome. His *Romaike Archaiologia* was in 20 books, and treated of history from the early times down to the First Punic war. Books 1–9 are entire, 10 and 11 nearly so, and there are fragments of others. He also wrote good essays upon Greek orators, a treatise upon the arrangement of words, and a work upon rhetoric.

Dionysus, or BACCHUS (and IACCHUS in the mysteries), in Greek mythology the god of wine, was born at Thebes, in Bœotia, of Zeus and Semele. According to one legend he was entrusted by Hermes to the Nymphs, who reared him upon Mount Nysa, whence his name. He is generally represented as wandering in the East with Satyrs and Mænads. He conquered India; at Naxos he encountered and married Ariadne, who had been deserted by Theseus; in Thrace he smote Lycurgus with blindness; and at Thebes, Pentheus was torn in pieces on Mount Cithæron for insulting the rites. He also changed the daughters of Minyas into bats. Sometimes Bacchus is represented as in the height of youthful beauty, accompanied by Bacchanals and drawn by panthers, and clothed in a panther's skin, bearing the thyrsus, and crowned with ivy and vine tendrils; at other times he is represented as older, and clad in Oriental raiment.

Diophantus of Alexandria, who lived in the middle of the fourth century, was the first Greek writer upon algebra. He also wrote 13 books of arithmetical questions, of which six still exist, and a work upon polygonal numbers.

Dioptrics, that part of optics which treats of light refracted by its passage from one medium to another in which the speed of propagation is different. *Catoptrics* is the old term for the part of optics relating to reflection of light. Hence the expressions dioptric and catoptric that were given by older philosophers to refracting and reflecting telescopes respectively. The terms are becoming obsolete.

Diorama, invented by Daguerre, is a panorama or range of painted pictures viewed through a small opening by means of reflected and transmitted light. [PANORAMA.]

Diorite, a basic crystalline igneous rock, including many of those formerly known as *greenstone*. It consists of plagioclase felspar, generally white, and hornblende, dark green or black, in varying proportions. There is usually some magnetite and minute needles of apatite present, and some varieties contain quartz or mica. *Corsite*, otherwise known as napoleonite or orbicular diorite, occurring in Corsica, contains globular aggregations an inch or two across, and is made up of greyish anorthite, blackish hornblende, and some quartz. *Kersanton*, or mica-diorite, has mica partly replacing its hornblende. Diorites are mostly granitoid in texture, but may be porphyritic. Their average silica percentage is 54 and specific gravity 2·95. They occur in Palæozoic volcanic necks as eruptive rocks.

Dioscorides Pedanius, a Greek physician of the first century A.D., was a native of Cilicia. He wrote a valuable work upon Materia Medica, and his researches upon botany, in five books, have much merit, and are still of high authority in the East. He was a soldier, and travelled in Asia Minor, Greece, and Spain, studying natural history. The authorship of a treatise upon poisons, sometimes ascribed to him, is disputed.

Diospyros. [EBONY.]

Dip. 1. The dip or inclination of the needle at any point on the earth's surface means the angle made with the horizontal by the earth's magnetic force at that point. If a straight piece of steel wire be supported by a horizontal axle passing through its mass-centre, it will practically assume any inclination that is given to it. But if it then be magnetised it tends to adjust its length in the direction of the earth's magnetic force; and when placed in the magnetic meridian so as to point to magnetic north and south we find it will assume a definite angle of

inclination to the horizontal that is subject to very slight change from year to year. Such an action is due to the fact that the earth is a magnet, and just as in the case of a bar magnet a small needle is differently inclined to the two ends at different regions about the bar, so with the earth a dipping-needle shows a varying inclination at different points on the earth's surface. In the region of the earth's magnetic poles, which are not far removed from the geographical poles, dipping-needles point vertically downwards, and the inclination has its maximum value of 90°. Along a somewhat irregular line passing round the earth in the equatorial regions the inclination is 0°, and the needle therefore horizontal. This line is called the *magnetic equator*. Lines of equal dip are called *isoclinic* lines, just as those of equal declination are called *isogonic* lines. The magnetic dip in London at present is about 67° 20′. It has been steadily diminishing since 1720, when it attained a maximum value of 74° 42′. These observations are made with a *dip-circle*, which is a needle carefully supported at its mass-centre and capable of rotation in a vertical plane about a horizontal axis. It admits of accurate adjustment in the magnetic meridian, and possesses a graduated vertical scale for the measurement of the required inclination of the needle.

2. The inclination of a stratum of rock, or of a fault, to the horizon, the stratum in question being said to dip at such and such an angle towards such and such a point of the compass. Thus the angle is the *amount* of dip; the point of the compass the *direction*. Horizontal beds have no dip, vertical ones a dip of 90°. Dip is measured by a *clinometer* or plummet with a graduated semicircle. A line at right angles to the direction of dip is called the *strike*, being the general direction of the *outcrop* or exposed edge of the stratum. Thus beds dipping east or west will have a north and south strike. The Secondary rocks of England have a general direction from south-west to north-east in the southern half of the country and due north and south in the northern half, their general dip changing similarly from south-east to east. Whatever their inclination, beds appear horizontal along the line of strike, and it is only sections or exposures at right angles to this line of strike that exhibit the *true dip*. Other sections show *apparent dips*. The lower the angle of dip the wider will be the outcrop (q.v.), on level ground that of vertical beds being equal to their thickness. If, therefore, we know the angle of its dip and the width of its outcrop, we can readily calculate the thickness of any bed and can similarly estimate its depth below the surface at a moderate distance from any part of its outcrop. Where strata dip in two opposite directions from a line of elevation we have an *anticlinal* (q.v.) or *saddle-back;* where in all directions from a centre, a *periclinal*, *dome*, or *quaquaversal dip;* where from opposite directions towards a depressed axis, a *synclinal* (q.v.), or *trough;* where from all directions towards a centre, a *centroclinal* or *basin*.

Dip, or Depression, of the Horizon. This is the sinking of the visible horizon below the true horizontal plane, when the observer's eye is raised above the surface of the sea. Approximately, the dip, in minutes, equals the square root of the height of the eye in feet. Allowing for refraction, the dip at various heights is as follows :—

Height. Feet.	*Dip.* ′ ″	*Height. Feet.*	*Dip.* ′ ″
5	2 9	40	6 4
10	3 2	50	6 46
15	3 42	60	7 25
20	4 17	70	8 1
25	4 52	80	8 34
30	5 15	90	9 6
35	5 39	100	9 35

Diphtheria (Greek *diphthera*, a membrane or pellicle), an acute specific disease characterised by general constitutional disturbance, associated with a peculiar inflammatory condition involving the tonsils and surrounding parts, or the larynx. In rare instances a skin-wound or the conjunctiva of the eye may be affected by an inflammation of a diphtheritic character; the local mischief is, however, usually manifested in the throat. In a typical case of diphtheritic sore-throat the tonsils are red and swollen, and present certain patches which are at first difficult to distinguish from particles of secretion exuding from the tonsillar follicles such as may occur in cases of simple sore-throat, follicular tonsillitis, a disease quite distinct from true diphtheria. These patches, however, if the inflammation be really diphtheritic, usually extend, assume a greyish white or dirty yellow colour, and form distinct pellicles on the surface of the mucous membrane. On attempting to strip off such a pellicle ("false membrane," as it is called), the subjacent mucous membrane bleeds readily. If the case be a severe one, extensive sloughing occurs, the breath becomes exceedingly foul, the glands of the neck undergo considerable enlargement, and the constitutional disturbance is great. The mischief is apt, too, to extend to the larynx, producing hoarseness and difficulty of breathing, which latter may assume very grave proportions, and terminate, if unrelieved by operation, in actual suffocation from blocking of the air-passages with false membrane. Diphtheria was first recognised as a distinct form of disease early in the present century by a French physician, Bretonneau. In Scotland cases similar to those described by Bretonneau were designated croup (q.v.), and there has resulted a great deal of discussion as to whether croup and diphtheria should be regarded as co-extensive terms. Pathologists have adopted the expressions croupous and diphtheritic inflammations, and have attempted to distinguish between the two by the microscopical appearances of the mucous membranes affected. [Croup.] Practically, it is nowadays considered advisable to look upon all forms of sore-throat in which false membrane is detected, whether in the pharynx or the larynx, as contagious.

The symptoms of diphtheria are general and local. The first general symptom is sometimes a rigor or an attack of vomiting. More often the commencement of the disease is very insidious. There is usually, when the disease is established, some fever present, but the temperature does not as a rule attain any considerable degree of elevation. Indeed, prostration and collapse are marked features

of the most severe cases. The pulse is small and feeble, the tongue dry and brown, the skin cold, and death, if it do not originate from local complications, usually occurs by syncope. The urine is generally found to contain albumen, sometimes in considerable amount.

The local symptoms are those of sore-throat, or, when the larynx is involved, of laryngitis, rapidly culminating in marked dyspnœa. The larynx is particularly apt to be involved in young children; the disease in them may apparently involve the larynx from the first. A "croupy cough" is rapidly succeeded by difficulty of breathing, with marked inspiratory recession of the chest-wall. If this condition is allowed to continue, cyanosis supervenes, and death occurs from suffocation. In such instances the only measure which will produce relief is tracheotomy. Unfortunately, in many cases, however, the benefit following upon the operation is only temporary, as the disease extends downwards, involving the lungs. Still, in not a few instances the temporary benefit gains a respite for the patient, in which the force of the malady spends itself, and recovery supervenes.

Certain sequelæ of a troublesome nature sometimes appear after an attack of diphtheria. The most common is a group of symptoms known as *diphtheritic paralysis*. There is some loss of movement in the muscles of the soft palate, with consequent difficulty in swallowing, and regurgitation of fluids through the nose. There may, too, be paralysis of the limbs, affection of the ocular muscles, loss of sensation, and loss of "knee jerk."

Diphtheria is said to affect damp situations. It has been attributed to insanitary surroundings, and the poison is said to be communicated by milk. The discharges from the inflamed surfaces are eminently contagious, and careful disinfection should be insisted upon. The attendants upon the patient should be careful, too, to avoid inhaling his breath.

The treatment consists in securing rest in bed, and adopting every means of supporting the patient's strength. Stimulants are usually required, and tonics, especially iron, may be given with benefit.

There are great differences of opinion as to local treatment, some advising the mere employment of some antiseptic gargle, while others place great reliance upon radical methods of dealing with the local trouble. When the larynx is involved, a warm moist atmosphere is generally procured for the patient by employment of a steam kettle. The most unremitting attention to the sufferer is necessary, as aggravation of the symptoms may occur in the most sudden and alarming manner, requiring the immediate performance of the operation of opening the trachea. During convalescence tonics are invaluable, and after the lapse of some weeks a change of air will be probably deemed advisable; great care, however, should be taken not to spread the disease by allowing the patient to go too early abroad. Paralytic symptoms, when they occur, are often very intractable. Electricity is often employed with benefit in the treatment of such cases at time of incubation.

Diphthong (Greek *dis*, twice; *phthoggos*, sound), commonly defined as "the union of two vowels in one sound." Strictly speaking, however, both the vowels are pronounced, and an intermediate sound, technically called a *glide*, develops in the passage from one to the other, there being no definite break between them. Diphthongs, of course, often arise from simple sounds (*cf.* German *mein*, Old German *mîn*), and also become simple sounds (*e.g.* the German *ä*, from *a-e*). The term, of course, refers to the spoken rather than the written language.

Diploma (Greek, from *diplöos*, twofold), originally a double and folding tablet. At the end of the Roman republic, and under the early empire, it was applied to any official document or letter of recommendation giving special privileges to particular persons (*e.g.* the privilege of availing themselves while travelling of the facilities usually confined to officials). Afterwards the word seems to have been applied, though not commonly, to all official documents (whence "diplomatics," a synonym for palæography). It was revived in the seventeenth century, and variously used, sometimes only for documents issued by kings and emperors, as contrasted with papal "bulls." The name is now usually given only to the documents which attest the conferring of an academic degree on their holder, or his admission to membership in some learned corporation; and in Germany to patents of nobility.

Diplomacy, the practical knowledge and application of the methods and rules of the intercourse of civilised nations. The study and formulation of these rules and methods arose as the Holy Roman Empire was weakened and the great military states of modern Europe grew up, from the fifteenth to the seventeenth centuries. The governments of these States were mostly despotic, and in all cases the management of affairs was in fewer hands than at the present time. Diplomacy, therefore, commonly involved minute knowledge and observance of Court etiquette, considerable judgment of character, and a very high degree of astuteness and tact, combined very often with complete freedom from scruples, especially in dealing with unscrupulous persons. Hence the somewhat unfavourable associations the term has acquired in popular language. In modern times, owing to the growth of democracy and public opinion, the peculiarities of the persons composing the government of a country usually count relatively for less than they once did; and the invention of the telegraph and other rapid means of communication have tended to leave less to the individual ambassador than formerly. He is now commonly instructed by telegraph almost daily in all important international negotiations.

Classes of Diplomatic Agents. As disputes had often arisen between the representatives of different countries at a foreign Court as to their precedence and the ceremonial to be observed in receiving them (as to which there was much minute regulation and much jealousy), the Congress of Vienna, on March 19, 1815, fixed the following classification: (1) Ambassadors, Legates, or Papal Nuncios; (2)

Envoys or Ministers accredited to Sovereigns; (3) Chargés d'Affaires accredited only to the Minister of Foreign Affairs of the country to which they were sent. In 1818 a class taking precedence of Chargés d'Affaires—viz. Ministers Resident—was formally recognised by the protocol of Aix-la-Chapelle, but these are not numerous. Some French Consuls-General are also Chargés d'Affaires. *Envoys Extraordinary*, strictly speaking, are sent on special missions, and take precedence over ordinary Ministers of the second class; but to secure this precedence, ordinary Ministers of this class often take the title of "Envoy Extraordinary and Minister Plenipotentiary." *Commissioners* to settle special questions—*e.g.* of disputed boundary—are a lower and special class of diplomatic agents. [CONSUL.]

Diplomatics. [PALÆOGRAPHY.]

Diplopoda. [MILLIPEDES.]

Dipnoï, an order of Palæichthyes, containing fishes which breathe both by gills and lungs. [CERATODUS, FISHES, MUD-FISH.]

Dippel's Oil, or ANIMAL OIL, a dark brown liquid obtained by the destructive distillation of animal matter, such as horns or bones. [BONE OIL.]

Dipper, any bird of the genus Cinclus, of the family Turdidæ (Thrushes), with nine species, all widely distributed in the Palæarctic region, and ranging to the alpine parts of America. The bill is straight, the nostrils are partly covered by a membrane, the feet large and strong. They are restless birds, frequenting the banks of clear streams, and often entering the water in search of the small molluscs, insects, and larvæ, on which they feed. One species, *C. aquaticus*, the Common Dipper or Water Ouzel, is British. The length of the male is about nine inches, brownish black above, white on the upper part of the breast, chestnut-brown on the belly. Its popular name has reference to the peculiar movements of the bird, which ducks its head and lifts its tail many times in succession as it pours forth its twittering song. The nest is a domed structure of felted moss, with a hole in the side, and is concealed with great art, generally near the water. The eggs are white, four to six in number, and there are usually two broods in a year.

Diprotodon, the largest known marsupial, a giant extinct kangaroo found in Tertiary caves, lacustrine and fluviatile deposits, in Australia. Its fore limbs were longer and its hind limbs shorter in proportion than those of the living kangaroos, but it was probably six times as large as the largest existing species, its skull measuring three feet in length.

Dipsas, the type-genus of Dipsadidæ, a family of nocturnal tree-snakes, chiefly from the Oriental, Ethiopian, and Neotropical regions. They are innocuous, and are distinguished from the tree-snakes (Dendrophidæ) by their nocturnal habit, and from the whip-snakes (Dryiophidæ) by their dark coloration. [DENDROPHIS, DRYOPHIS.]

Dipsomania (Greek *dipsao*, I thirst; *mania*, madness). [ALCOHOLISM.]

Diptera, the class of insects which includes the Flies. The character of the order is the possession of a pair of clear transparent wings. The hinder wings may be completely aborted, but usually persist as the "halteres" or balancers. The mouth appendages form a proboscis. The metamorphosis is complete, for the larvæ are active but footless worm-like maggots. The character of the wings and the rudimentary nature of the posterior pair are the two most prominent characters. The wings are never clad in scales or hairs, and have few veins: most of these are longitudinal. In some cases the number of wings appears to be four, as there is a pair of winglets or "alulæ," but these are only lobes of the anterior wings. The two main orders are the Nemocera and Brachycera. The Fleas were once included as a division of the Flies, but are now generally regarded as a distinct group, the Aphaniptera (q.v.). The principal flies are the House Flies (*Muscidæ*), the Crane Flies (*Tipulidæ*), the Gall Flies and Hessian Flies (*Cecidomyidæ*), the Gad Flies (*Sabanidæ*), the Robber Flies (*Asilidæ*), the Bee Flies (*Bombylidæ*), the Bot Flies: reference should be made to each of these. Fossil flies are rare, except those in amber. The order is a very large one: the British species probably exceed 4,000 in number. The flies are world-wide in distribution, occurring high on the flanks of the Andes and in high latitudes in the Arctic region. In many regions they are a source of serious difficulty, as they attack cattle and horses; some genera cause pestilence, from which man is not free, as in the case of Lucilia, which devastated the French convict settlement at Cayenne. In many parts of the world they occur in such abundance as to form veritable plagues, such as those of the genus *Simulium*, which have from time immemorial invaded Egypt, and are also met with on the sandy deserts of Western Australia.

Diptych (Greek *diptuchos*, double), properly a picture with two leaves or panels. In the early Church the name was applied to a register of benefactors, the living being on one panel, the dead on the other. Both were specially commemorated in the prayers of the Church. The diptychs were often adorned with painting or carving, and were sometimes of ivory. They are of considerable importance in the history of art.

Dipus. [JERBOA.]

Dirce, in Greek mythology, wife of Lycus, king of Thebes. Her jealousy led her to imprison Antiope, who escaped, and whose sons afterwards killed Dirce by fastening her to a wild bull. The group by Apollonius and Tauriscus representing this event is well known.

Direct Currents of electricity are those in which the electric displacements along the conductor take place continuously in the same direction. In this respect they differ from alternating currents, where the displacements are continually oscillating backwards and forwards. As for the advantages of either system in electrical engineering, no one is at present really qualified to give

an ultimate answer. Whereas direct currents are simpler to work, their instruments easier to design and understand, and their behaviour in novel combinations readily to be predicted, alternating currents, on the other hand, offer serious difficulties in each of these respects. But so little is known of alternating currents as yet that it is useless to condemn them on account of the above difficulties. Alternate current generators are certainly better in some ways [DYNAMO], and transmission of power by means of such currents is already the more convenient. Moreover, the recent researches of Hertz, Tesla, and others point to an immense extension of the principle of power transmission in an alternating system, and a fuller knowledge of this is hoped for and expected by many. Both direct and alternating currents may be used for the electric light, which depends for its production on the generation of a white heat in an imperfect conductor that offers considerable resistance to the motion of electricity. Inasmuch as such a conductor offers resistance to motion in either direction, its heating is continuous though the current be alternating. In electro-metallurgy, where currents are made to deposit metals from solution, a reversal of the current produces a reversal of the deposition. Alternating currents are in that case useless, direct currents alone being employed.

Directory, in French history. After the fall of Robespierre and the Committee of Public Safety, the more moderate party adopted "the constitution of the year III." By this the Legislature was to consist of a "Council of Five Hundred," who prepared the laws, and a "Council of Ancients," who sanctioned them. The former presented a list from which the latter chose five members, who were appointed directors, and in whom was vested the supreme executive power, and the appointment of ministers, and other officers of state. One Director was to retire annually. The Directory, consisting of Larévellière-Lepeaux, Rewbel, Carnot, Letourneur, and Barras, came into office on October 28, 1795. It was a *bourgeois* government, with a vigorous foreign policy, unpopular alike with Royalists and advanced Republicans, and to some extent chargeable with corruption. Hence it was almost destroyed by a Royalist movement in 1797, and was finally overthrown by Bonaparte's *Coup d'état* of 18 Brumaire, November 9, 1799, when it gave place to the Consulate.

Directory for Public Worship, a system of rules for the conduct of public worship in the Established Church of Scotland, adopted by the General Assembly of that Church in 1645, in place of the form of liturgy then in use and originally drawn up by John Knox. A similar set of rules, called by the same name, exists for the Free Church. Both in the main consist of suggestions rather than of set formulas.

Directrix, in the geometry of conic sections, a fixed line in a certain relation with a fixed point called the *focus*, and with the curves in question. From it the distances of all points on each curve are measured, and are found to bear a certain ratio to the corresponding distances of the points from the focus.

Dirk (Gaelic *duirc*), a small dagger, part of the costume of a Highlander. The handle, projecting from the stocking, is a familiar feature of Highland costume. Also the side-arm of midshipmen in the British navy. This is a long heavy dagger, with a white handle.

Dirschau, a town of West Prussia, on the left bank of the Vistula, in the government of Dantzig. There is much navigation at this spot, and a considerable exportation of timber.

Disability, the incapacity of anyone to do a legal act. It is either (1) *absolute*, *i.e.* wholly disabling the person and his descendants or successors while it continues, or (2) *partial*. Instances of the former are, or were, outlawry, excommunication, attainder (*see* those titles); of the latter, infancy, coverture, drunkenness, and lunacy.

Disbar, the compulsory expelling of a barrister from the bar. It is a power vested in and exercised by the Benchers of the four Inns of Court, subject to an appeal to the judges. It is founded on professional misconduct, but is rarely exercised. [BARRISTER.]

Discharge, in *Electricity*, means the neutralisation of free electricity by a removal of the stress that has kept it in place. Thus a cloud of water-particles in the air may be heavily charged with electricity, and may be prevented from discharging itself by too great a thickness of air insulation between it and the earth or another cloud. This thickness of air is subjected to a stress, and may be insufficiently strong if the pressure or potential in the thunder-cloud becomes greater. This being the case a discharge takes place through the air to the earth or neighbouring cloud, and the tension is relieved. If a charged conductor be pointed, it will be found that the density of the electricity is much greater in the pointed regions, and that a silent convective discharge may take place there. [BRUSH DISCHARGE.] In *Hydraulics* the discharge of a river, weir, or other channel for the flow of water denotes the quantity of water that passes over in a given time. It will depend on the head of water and on the dimensions of the channel. The discharge may be estimated for small streams by triangular or rectangular *gauge-notches* (q.v.), through which the water is made to pass. In the case of large discharges, it is usual to calculate the quantity by means of observations on the average speed of flow and on the dimensions of the channel.

Discina, a genus of Brachiopoda, and the type of the family Discinidæ. It is one of the hingeless genera belonging to the order Tretenterata (q.v.). The family ranges from the Lower Silurian to the present.

Disciplina Arcani (Lat. = discipline of the secret), a name given by seventeenth-century theologians to a rule in the early Christian Church by which unbaptised persons or catechumens were excluded from admission to the more solemn mysteries of the faith. Some catechumens, according to St.

Chrysostom, were even forbidden to use the Lord's Prayer, and were only allowed to read select parts of Scripture. This "discipline" reached its extreme in the fourth century A.D., and afterwards disappeared. The idea was doubtless borrowed from Paganism.

Discipline, THE TWO BOOKS OF, in the history of the Established Church of Scotland, are the two authorised statements of its organisation which impressed on it a distinctly democratic and non-episcopal character. The First Book, though not formally adopted, was laid before an assembly of clergy and Protestant noblemen held in Edinburgh in 1561, and signed by most of them in January of that year. It provided that each congregation should elect its ministers and elders, while superintendents, also elective, were to supervise each group of congregations. It was chiefly drawn up by John Knox, and the system it introduced was to a great extent suggested by the ecclesiastical organisation of Geneva under Calvin. The Second Book, sanctioned by the General Assembly of the Scottish Church in April, 1578, and formally adopted in 1581, enacted that no more bishops should be appointed, and subordinated those who already existed to the General Assembly. The government of the Church was transferred (1) in the first instance to the Kirk session, consisting of the ministers and elders; over this were (2) the Presbytery, consisting of the ministers of a district and the elders of each congregation; (3) the Provincial Synod, consisting of all the presbyteries of a given district; (4) the General Assembly, elected by the Presbyteries. The books are still the bases of the Presbyterian ecclesiastical order, and similar books exist for the Free Church, and some other dissentient bodies.

Discoboli, a family of Acanthopterygian Fishes, of which the Lumpsucker (q.v.) is the type.

Discoidea is a well-known genus of fossil Echinoidea which includes two species which are typical of the Lower Chalk and Upper Greensand; the most conspicuous feature of this genus is the presence of a series of ten raised ridges along the inner lower side of the test (or shell); these radiate from the mouth. Around the mouth is a raised girdle for the support of the jaws; the exact relations of this structure have been much discussed.

Discoideæ, a family of Siphonophora (q.v.) in which the body (or technically the "cœnosarc") has a disc-like form; in the best known genus, *Velella*, this disc bears a strong vertical crest. Like all its allies of this group the Discoideæ are free swimming, and live upon the surface of the tropical and subtropical oceans.

Discophora. [HIRUDINEA.]

Discount, in *Commerce*, the sum allowed in reduction of payments made before they are due. Thus, if a bill of exchange for £100 payable one month after sight be paid at sight, the sum paid will be, not £100, but the sum which will produce such interest in one month as added to it would make £100; *e.g.* suppose the rate of interest were 6 per cent. per annum, or 10s. per cent. per month, the "present value" of such a bill would be £99 10s. In practice, an additional deduction is made for commission and for insurance against the risk of eventual non-payment, according to the presumed solvency of the acceptor and endorsers, if any, of the bill. The whole deduction is popularly called discount. The "Bank rate of discount" is the rate at which the Bank of England will lend money for short periods on first-class security, the money being lent by discounting bills. It is fixed weekly by the Court of Directors, not, of course, that they can bind other discounters, but because, as the largest holders of loanable capital, their statement of their terms for loans more or less determines the "money market." The rate, of course, is high when loanable capital is scarce (*e.g.* either when trade is very brisk, or during a panic), and low when it is plentiful (as during trade depression). Discount on sales, for cash, arises with the development of commerce and the increased opportunities for "turning over" capital. To secure that as much of his capital shall be employed as possible, the seller reduces his price for cash, recouping himself out of the profits due to his increased turnover.

Discovery, the process which enables one party to an action to obtain from the opposite side information upon oath. It is of two kinds: 1. Discovery by interrogatories of facts relative to the matters in question and within the knowledge of the party interrogated. 2. Discovery of documents relating thereto and in the possession of the party.

Disestablishment, the process of reducing a State Church (q.v.) to a Free or "voluntary" Church by depriving the State authority of the power either of appointing to ecclesiastical office or of taking any part in the settlement of disputed questions of doctrine and ritual. Thus in England the Crown is patron of many livings, and appoints to bishoprics, deaneries, and other ecclesiastical dignities, and determines ecclesiastical law through the State courts. Disestablishment would transfer these powers to persons or bodies appointed by the members (clerical and lay) of the Church of England. The process, however, would almost necessarily be accompanied by Disendowment, or diversion to other (probably secular) objects of property hitherto devoted to ecclesiastical uses.

Disinfectants. A distinction is often drawn between a disinfectant and an antiseptic (q.v.). The former is said to destroy, the latter only to arrest the development of germs. Thus all chemical disinfectants may by dilution be converted into antiseptics; but, on the other hand, it is most important that in the process of disinfection reliance should not be placed upon a mere antiseptic substance. Heat is the most reliable disinfectant. Distinction must be carefully drawn between dry heat and moist heat. No form of bacterial life can withstand for many minutes the action of boiling water. Dry heat of like degree, to prove equally efficacious, must be allowed to act for a longer time. In the disinfection of clothing, heat in some form

or other is applied. The best plan is to adopt some kind of steam-heating, and there are several forms of such apparatus now in the market. Steam possesses great penetrating power, and is much more reliable than is mere dry heat. Among chemical disinfectants perchloride of mercury takes the first rank. Its application to any article which is too valuable to destroy is, however, but limited. It is invaluable for the disinfection of morbid discharges, such as cholera-stools and the like. Carbolic acid is a much less powerful disinfectant than is the chloride of mercury, and to be effectual it should be used liberally and in concentration. Condy's fluid and the like are merely antiseptics, and are not to be relied upon where actual disinfection is requisite. In the disinfection of rooms, etc., sulphurous acid gas is commonly employed, this gas being generated by the ignition of flowers of sulphur. This method requires very thorough carrying out to be effectual. Chlorine gas is probably more reliable.

Dislocation (derived from two Latin words and signifying *a displacement*) is a term applied in surgery to the separation of the two surfaces of a joint arising from violence or from disease. In some instances the abnormality exists from birth, being acquired in the fœtal state ; it is then spoken of as congenital dislocation. Dislocations are described as *complete* and *partial*, and as *simple* and *compound*. By a compound dislocation is understood the condition in which matters are complicated by a skin-wound, which opens up the injured joint and admits air to its cavity. The chief symptoms of a dislocation are pain, impaired power of movement, and alteration in the natural shape of the parts. There are two main methods of treating a dislocation—viz. "manipulation" and "extension." When the surgeon has succeeded in restoring the parts to their natural position, or in "reducing the dislocation" as it is called, he applies some form of apparatus so as to keep the injured structures in place until healing is complete. Some of the more common forms of dislocation are dislocation of the lower jaw, of the clavicle, of the humerus, of the elbow-joint, of the thumb, of the hip-joint, and of the ankle-joint.

Dismal Swamp, The, a marshy tract lying a little south of Norfolk, in Virginia, and extending into South Carolina, having an area of 150,000 acres and a length of 30 miles, with an average width of 10 miles. It was covered by trees and brushwood, but parts of it are now cleared and drained. Drummond's pond, in the middle, is a lake 7 miles long. A canal passes through it from Chesapeake Bay to Albemarle Sound.

Dispensation. In the Roman Catholic Church, the relaxation of a law in a particular case where circumstances render it inapplicable. Aristotle (*Ethics*, v.) pointed out that law, though universal, cannot possibly be so stated as to cover all cases, and that a higher justice or "equity" is required to meet exceptions. On this doctrine the Roman Catholic theory is based. The Pope, as the successor of St. Peter (to whom was granted the power of binding and loosing), can dispense from such obligations to God as have been voluntarily undertaken, and also from all ecclesiastical laws. Bishops have a similar but less extended power; while priests can dispense from many obligations—*e.g.* fasting (in the case of illness, for instance). The term is also used, commonly in Protestant theology, to signify one of the different periods and methods of God's dealings with mankind—*e.g.* "the Jewish dispensation," "the New Testament dispensation."

Dispersion, in *Optics*, means the separation of rays of different refrangibilities when passed through a prism or lens. If a beam of light be composed of different colours, it will be split up into its constituents when passed through a prism ; the rays will be deviated from their original direction, but each colour will be deviated differently. Thus, although at first the rays are all coincident, their ultimate directions are dispersed. Another prism of different transparent material may produce the same amount of dispersion between any two coloured rays, but with less deviation. It is by combining two such prisms that we are able to get a resultant deviation without any dispersion, and so to obtain more or less complete achromatism (q.v.). Newton thought that the deviation depended simply on the dispersion, and that no such combination could be effected.

D'Israeli, Benjamin. [Beaconsfield.]

D'Israeli, Isaac (1766–1848), an English man of letters, was born at Enfield, in Middlesex, his father, Benjamin D'Israeli, being a Spanish Jew who came from Venice to England in 1748, and made a fortune. The son Isaac had no turn for commerce, but displayed a great taste for literature, which he was allowed to follow up. His first work was upon the abuse of satire, which was directed against "Peter Pindar." In 1791–1793 appeared the work by which most people know him—*The Curiosities of Literature*. In 1795 he published an *Essay on the Literary Character*, and later *The Loves of Mejnoun and Leila*. In 1828–1831 appeared *The Life and Reign of Charles I.* Trouble with his eyes put a stop to other projected works, but in 1841 he produced *Amenities of Literature*. His son Benjamin D'Israeli (Lord Beaconsfield) published in 1849 an edition of his works, preceded by a notice of his life.

Dissection Wounds. If inoculation of the fingers or of other parts occur in the process of dissection or in post-mortem examinations, serious complications are apt to supervene. A condition of pyæmia (q.v.), in fact, may be set up, and may terminate fatally. Hence the necessity for the exercise of the greatest care in handling and dealing with tissues in which the processes of putrefaction are established.

Dissepiments, the transverse plates which cross the chambers from septa to septa in most corals. The plates are obliquely placed, and are never continuous right across a coral. Such complete horizontal plates are known as tabulæ. [Coral.]

Dissociation is a term applied to the gradual decomposition of a substance by heat into simpler components, generally two; the decomposition ceasing on stopping the supply of heat, and recombination gradually occurring as the temperature falls. The amount of decomposition thus increases with the temperature until it reaches a maximum, when the decomposition is complete. The rate of dissociation at first increases, reaches a maximum amount, and then decreases. Since the discovery of the phenomenon by St. Claire Deville, who gave to it the present name, the investigation of dissociation changes has been of great importance in physical and general chemistry. Thus the abnormal vapour-densities of many substances—*e.g.* phosphorus pentachloride (PCl_5), ammonium chloride (NH_4Cl), acetic acid, etc.—are satisfactorily explained in view of a partial or complete dissociation. For example, the compound NH_4Cl at temperatures at which it is vaporised, is dissociated into NH_3 and HCl (ammonia and hydrochloric acid gases), which recombine on cooling. As a result, the vapour-density found is only one-half that indicated by the formula. To obtain proofs that dissociation does occur, and to separate the products in such cases, various methods have been employed, and in many cases, as in the example given, the unequal rates of diffusion of the components [DIFFUSION] may be successfully applied.

Dissolving Views are produced by arranging two magic lanterns so that the light from each shall fall precisely on the same place. A view is then projected from one, the light of which is gradually cut off, and at the same time the light from the other is gradually turned on, so that the view projected from the first appears to dissolve into that projected from the second.

Dissonance, in *Acoustics*, means the want of harmony in the simultaneous sounding of different notes. Dissonance is produced when the frequencies of the various constituents do not bear any simple arithmetical relationship to each other.

Distemper, a disease affecting young dogs. It is analogous to the diseases of childhood which occur in the human subject, and, like them, is contagious, and an attack protects the system against any recurrence of the disease. The usual symptoms of distemper are catarrhal, the parts involved being the eyes, nostrils, and bronchi.

Distemper (from French *détremper*, to moisten), or TEMPERA (Ital. *mixture*), is a method of painting in which the colours are mixed with water and some gelatinous substance to keep them together. In Italy the juice of figs was used; in mediæval Germany, dilute yolk of egg and glue made from chippings of parchment. The surface of the walls to be decorated was commonly prepared by a thin coating of plaster, which, however, unlike Fresco (q.v.), was left to dry before the paint was applied. But the process is applicable to any material, and was used extensively in ancient Egypt and Babylon, in Greece, and to some extent in Rome, for internal mural decoration; but the colours will not resist exposure or damp. It was used in the Middle Ages for MS. decoration, and was the common process for panel paintings till driven out by oil painting during the latter half of the 15th century. The old Italian and German panel pictures are in distemper. The brilliancy of some of the latter is due to the use of a varnish, of which the chief ingredient was wax. Distemper pictures are sometimes difficult to distinguish from oil paintings.

Distich (Gr. *dis*, twice, and *stichos*, row, line), a couplet, often epigrammatic in character.

Distillation is the separation of a volatile liquid from a non-volatile substance by the application of heat. If more than one volatile liquid be present, the distillation may also have for its object the partial or complete separation of the different products, as in *fractional distillation*. In cases where a solid is strongly heated so that it is destroyed and decomposed, with the evolution of gaseous products, the process is known as *destructive distillation*. The essential parts for a distillation are—(1) the *still*, the vessel in which the substance is heated; (2) the *condenser*, in which the volatile products are condensed to the liquid state; (3) the *receiver*, where the liquid is collected. For a simple distillation this is all that is required. In the chemical laboratory the still usually takes the form of a flask; the neck, into which a thermometer may be placed, being provided with a side-tube, which is connected to the Liebig's, or other condenser (q.v.); the receiver being either a flask or a bottle placed below the end of the condenser. In the arts, various forms of stills, generally of copper, and specially arranged condensers are employed, according to the nature of the special distillation for which they are required. When it is necessary to separate the products, the liquid is heated in the usual way, and the temperature slowly rises. The portions which boil off between fixed ranges of temperature are separately collected, and the portions re-distilled and again collected as before. By this means it is found, after a few distillations, that the greater bulk of the liquid can be obtained in a few portions, each boiling at a nearly constant temperature and nearly pure; but to obtain very pure substances by this means—*fractional distillation*—is a laborious and sometimes practically impossible process. Frequently different condensers, cooled to different temperatures, are employed, the least volatile liquid being first condensed, the more volatile portions passing on to following and colder condensers. Special forms of apparatus, in which the less volatile portions condense above the still and run back into it, are also largely employed both in the laboratory and the manufactory. In certain cases, as in the purification of mercury, distillation has to be effected under reduced pressure—*i.e.* in a more or less complete vacuum—and at other times, owing to the action of air upon some of the products, all the apparatus has to be kept filled with an inert gas, usually nitrogen or carbon-dioxide. Destructive distillation is employed little in pure chemistry, but largely in industrial process, as *e.g.* in the production of coal-gas.

Distomum. [LIVER FLUKE.]

Distortion means change of shape. When a

body is subjected to stress it undergoes a change of shape and is said to become distorted or strained. Strictly speaking, strain applies to any change in the dimensions of the body, whereas distortion applies to irregular change. A sphere compressed to a smaller sphere is strained but not distorted; a sphere compressed to an ellipsoid is distorted.

Distress, a mode by which the law allows a man to minister redress to himself by distraining the goods of another for non-payment of rent or other duties, or to distrain cattle, "damage feasant," that is doing damage or trespassing upon his land. The former species of distress is for the benefit of the landlord to prevent tenants from secreting or withdrawing their effects to his prejudice. As to the latter [DAMAGE FEASANT], as a general rule, all chattels and personal effects found upon the premises may be distrained by the landlord whether they belong to the tenant, his under-tenant, or a stranger; but to this there are many exceptions, too numerous to be mentioned here. In ordinary cases the most common exception is goods entrusted to the tenant in the way of his trade—as a watch sent to a watchmaker to be repaired. The landlord's powers are chiefly regulated by an Act passed in the second year of William and Mary as amended by the "Law of Distress Amendment Act, 1888," which made applicable to all tenancies some of the provisions applicable to agricultural tenancies only by the Agricultural Holdings Act, 1883. A landlord may himself personally exercise his right of distress, but it is usual and expedient to employ a broker, who is duly appointed to the office, and exercises it under certain rules.

Distribution, or CHOROGRAPHY, is that division of Zoology which deals with the geographical distribution of animals. It has a double value, as it throws much light both on the physical conditions and geography of past ages as well as on the lines along which the evolution of various groups of animals has proceeded. The distribution of land and water animals depends on such different conditions that it is best to consider them separately. Taking the land animals first, we soon see that the distribution does not depend simply on distance, which in fact has but a comparatively slight influence. Thus, if we compare the faunas of England and Japan we find many very striking resemblances between them; if, on the other hand, we compare those of Bali and Lambok, two adjacent islands in the Malay Archipelago, we find the faunas fundamentally different. England and Japan were probably once both connected to the great European and Asian continents, whereas Bali and Lambok are separated by deep sea and in all probability have never been united: the one has always belonged to the continent of Asia and the other to Australasia. The two main factors that control the distribution of any group are the power of migration and locomotion possessed by its members and the date of the appearance of the group in the life history of the world. Thus, with the former, we should expect animals that can fly to be most widely distributed; next to this would come those whose eggs or larvæ would be most likely to be carried about by birds or on floating timber. Those to which sea-water is most fatal would naturally be most restricted. Thus if we take the case of an oceanic island it is natural to find that its principal inhabitants are birds, rats that have escaped from passing ships, other small mammals and snakes that have floated across on timber, insects whose eggs or larvæ have been carried by birds, etc.; animals, such as slugs, to which sea-water is absolutely fatal, are the rarest.

The date of the evolution of a group has an important bearing, because, if an old one, the main lines in its present distribution may have been laid down at a time when oceans and continents were differently arranged. Hence, if the world be mapped out into zoological provinces, different groups would yield very different divisions. For example, the best known arrangement of zoological provinces is that made by Mr. Selater, and is based on birds. He divides the world into six provinces, the Palæaretic (Asia, north of the Himalayas, Europe and Africa, north of the Sahara), the Nearetic (North America, except Mexico), the Ethiopian (Africa, south of the Atlas Mountains), the Neotropical (Central and South America), the Oriental (India and South-east Asia), and the Australasian. But the birds are probably the most recently developed group, and, therefore, in spite of their powers of flight, it is natural to expect them to agree most closely with existing geographical conditions. But if we take an old group such as the Tortoises (Chelonia) we only get five provinces. The first includes all Asia, Europe, North Africa, and North and Central America; the second consists of the rest of Africa; the third of South America and Madagascar; the fourth of Australasia, except New Zealand, which forms the fifth. The Lizards, again, have a very different distribution. The whole of the New World forms but one province; Africa, Europe, and Northern Asia form a second; India and South-east Asia form a third; Australia, New Guinea, etc., a fourth; while Madagascar and New Zealand constitute the fifth and sixth. The Snakes, Mammals, Amphibia, etc., also give different divisions, and thus the evidence of any one group is not sufficient to demonstrate that continental distribution has not always been the same as it now is.

An instance of the limitations on the distribution of a group caused by its later introduction is afforded by the absence of snakes from Ireland. The severance of England and Ireland was effected at a time when the climate had not fully recovered from the arctic cold of the Glacial period; hence though most animals could live in the country it was too cold for the snakes, who only entered the British area after the Irish Sea had separated Ireland.

In regard to marine animals, as the conditions of life are more equable, they have a wider range. We have to consider the range both in space and depth. The latter, or the bathymetrical range, depends on the supply of light and heat. Light can only penetrate to a limited depth, and the water below is dark, except for the light derived from the phosphorescence (q.v.) of the animals. Similarly,

below a certain depth the temperature of the water is constant at about 39° Fahrenheit; therefore, animals such as reef corals, which require a high temperature, cannot live below fifteen to thirty fathoms. The conditions in the deeper parts of the great ocean-basins are not very favourable to life, and therefore the animals that live in them are those that have been driven downward by natural selection from the more favourable shallower zones, where they were unable to gain a living; they have, as a rule, a somewhat bizarre aspect, and frequently possess features which were probably once possessed by the ancestors of the group. The deep-sea fauna has, therefore, frequently been regarded as a primitive one, but it is more probable that these characters have been reacquired and are secondary. The shallower zones have been divided into several divisions, known as the Coralline, the Laminarian, etc., but these terms have fallen into disuse. The marine zones now accepted are the littoral (down to 100 fathoms), the continental (from 100 to 1,000 fathoms), and the deep sea (below 1,000 fathoms).

In regard to distribution in space the main influence is as to whether the group is fixed or free; in some mollusca, such as the Scallops (*Pecten*), which are locomotive, the species have a world-wide distribution, while in other closely allied forms, such as the oyster, they are restricted within narrow limits. In many cases fixed forms have free-swimming larvæ and thus gradually become widely scattered. The general aspect of the littoral fauna is given it by the modifications assumed to enable its members to withstand currents and tides; thus they are fixed and flexible such as the Zoophytes; fixed, rigid, and strong as the Corals; low and flat, with plenty of power of attachment, as in Starfish, Sea-urchins, Crabs, and flat-fish; or they may burrow through sand and mud, as Cockles, Sandworms, etc.

It has been maintained that the deep sea is uninhabited and that the forms obtained from it are either dead animals that have fallen to the bottom or are picked up by the net near the surface. The operations of recent deep-sea exploring expeditions, such as the *Albatross*, working with closed nets, leave no doubt that there is a true abyssal fauna.

In 1855 Mr. A. Wallace stated the following propositions:—"Large groups, such as classes and orders, are generally spread over the whole earth, while smaller ones, such as families and genera, are frequently confined to one portion, often to a very limited district. In widely-distributed families the genera are often limited in range; in widely-distributed genera well-marked groups of species are peculiar to each geographical district. When a group is confined to one district and is rich in species, it is almost invariably the case that the most closely-allied species are found in the same locality or in closely adjoining localities, and that, therefore, the natural sequence of the species by affinity is also geographical. Most of the larger and some smaller groups extend through several geological periods. In each period, however, there are peculiar groups, found nowhere else, and extending through one or several formations. Species of one genus or genera of one family occurring in the same geological time are more closely allied than those separated in time. As generally in geography no species or genus occurs in two very distant localities without being also found in intermediate places, so in geology the life of a species or genus has not been interrupted. In other words, no group or species has come into existence twice." From these facts he deduced the law that "every species has come into existence coincident both in space and time with a pre-existing closely-allied species." In other words, the succession of plants and animals in geological time and their geographical distribution can only be explained on the theory of descent or evolution, and when so explained the facts of succession and distribution are hardly less important as indicative of affinity or pedigree than are those of embryology and comparative anatomy.

As to geological succession, we can only here make a few general remarks. The farther we go back the more unlike is the general assemblage of plants and animals to that which now exists. There has certainly been on the whole a steady advance in organisation, and an increase in variety and complexity, from the earliest geological periods to the present day. In each group, *generalised types*, combining, that is, the characters of two or more types which have subsequently become distinct, have preceded the more *specialised* or *differentiated* types. Thus the insects from the Palæozoic rocks have been grouped in an order, the Palæodictyoptera, combining the characters of the Neuroptera, Orthoptera, and Hemiptera, whilst such Eocene Ungulata (q.v.) or hoofed animals as Palæotherium and Anoplotherium, or such Carnivora as Cynodictis, combine the characters of horse, tapir, and rhinoceros, of pigs and ruminants, or of dogs and cats, these more specialised groups of mammals seldom occurring below the Miocene. The imperfection of the palæontological record, arising partly from the non-preservation of most land animals or of those destitute of hard parts, and partly from the subsequent destruction or metamorphosis of so many feet of fossiliferous strata by denudation or by heat, is so great as to prohibit all argument from negative evidence. Thus we know four species of fossil mammals from Triassic rocks, none from the Lias, four from the base of the Bath Oolite, and none from any part of the Jurassic series until we come to the Purbeck, and then in one small area one bed has chanced to yield us 25 species. Some of the Triassic forms, all of which are Marsupialia (q.v.), are herbivorous, others are carnivorous; so that the primitive mammal was presumably Palæozoic. Similar reasoning led Darwin to the conclusion that before the curiously varied series of Invertebrata that occurs in the Lower Cambrian (q.v.) system could have lived, "long periods elapsed as long as, or probably far longer than, the whole interval from the Cambrian age to the present day, and that during these vast periods the world swarmed with living creatures."

Botanists subdivide the Northern division into three floras, the Arctic-Alpine, the Temperate, and

the Mediterraneo-Caucasian. The Arctic-Alpine occupies the northern parts of both Old and New Worlds, with many interesting detached areas, whither it was carried in Glacial times, includes saxifrages, gentians, cranberries, rhododendrons, and primroses. The Temperate includes the zone of needle-leaved pines and firs, succeeded southward by that of deciduous catkin-bearing broad-leaved trees, and is marked by the cultivation of apples, potatoes, wheat, barley, and oats, by numerous Compositæ, such as asters, in America, and by Umbelliferæ, such as the giant cow-parsnip, in Siberia. The Mediterraneo-Caucasian flora is largely evergreen, including myrtles, laurels, evergreen oaks, a fan-palm, and the area of the cultivation of maize, almonds, olives, figs, grapes, and oranges. The Tropical division, characterised by large evergreen trees, palms, and bamboos, includes the Indo-Malayan or Oriental flora, that of ginger, rice, mango, tea, and teak; the Tropical African, that of date, and oil-palms, baobabs and spinous euphorbias; and the Tropical American, that of the ivory-palm, rose-wood, caoutchouc, and mahogany. The Southern division includes the Australian flora, that of gum-trees and Epacris; the South African, that of pelargoniums, heaths, everlastings and carrion-scented stapelias; the Andine, represented from Tasmania and Victoria to Western America, the flora of Fuchsia and Calceolaria; and other scattered floras.

Distribution. [Political Economy.]

District of Columbia. [Columbia.]

Dithyramb (Gk. *dithyrambos*, perhaps originally a name of the god Dionysus), originally a hymn sung by a chorus round the altar of Dionysus, celebrating his sufferings and triumph. (Most probably Dionysus in one aspect is the productive powers of Nature, which are overpowered in winter but triumph again in spring and summer.) Its invention is ascribed by Herodotus to Arion (q.v.), but most probably he only gave it a more artistic form. While it gave rise to tragedy (q.v.) it was developed into an independent branch of poetry, chiefly by Lasos of Hermione, who was the court-poet of the Pisistratidæ at Athens. Pindar (q.v.) and Simonides were important dithyrambic poets. Contests of dithyrambic choruses were held at Athens till after the Peloponnesian war, and dithyrambic poets are known till the middle of the 4th century B.C. Their subjects were mythological, but had long ceased to be confined to the sufferings of Bacchus. But the style, we are told, declined and became turgid and bombastic.

Ditmarsh, a district lying between the Elbe and the Eider, forming part of the old Duchy of Holstein, and the present Prussian province of Schleswig-Holstein. It was colonised from Friesland and Saxony, and was subdued by Charlemagne. But throughout the Middle Ages the district remained independent—a kind of lowland Switzerland—in spite of many efforts to subdue them, and it was said of them that they had neither lords nor head but did what they liked. They did not really submit till weakened by religious quarrels in 1559. In 1773 they were incorporated in the Danish kingdom.

Diu, an island of Hindustan, belonging to Portugal. It lies to the north-west of the Kattywar coast, being separated from Gujerat by a narrow channel. It is seven miles long by two wide, and is seventeen miles north-west of Bombay. At the east end is the town of Diu, which has a good port and once had a good trade, but this has passed away from it. The soil is sterile and there is no good water, but ginger is to some extent cultivated. The island became Portuguese in 1575, but was afterwards lost and retaken.

Diûr (JÛR), a Negroid people of the White Nile, north-east of Gondokoro and south of the Bahr-el-Ghazal, who give their name to the Diûr affluent of the Nile, which flows through their territory. The term Diûr, meaning "Men of the Forests" or "Savages," is applied to them by their northern neighbours, the Dinkas, because they do not keep cattle. They are partly dependent on the Dinkas, but they call themselves Luo, and claim to be a branch of the Shilluk nation, whose language they speak with great purity. Like the neighbouring Bongos they are of reddish rather than black complexion, and although without cattle they breed goats, possess poultry, grow durra beans, sesame, sweet potatoes, and ground nuts (*árachis hypogœa*), and manufacture their own arms, chiefly spears and arrows, from the iron which abounds in their country. Besides iron smelting and forging, they make pottery and extract butter from the nut of the butter tree (*Bassi Parkii*). The Diûrs, who go nearly naked, show great affection for their children, and also carefully tend the infirm and aged. Since the middle of the century they have suffered much from the Arab slave-hunters and from the exactions of the Egyptian officials. (Schweinfurth, *Heart of Africa;* Junker, *Travels in Africa.*)

Diuretics, substances which increase the amount of the urinary secretion. Diuretics either act by modifying the calibre of the minute arteries and so raising the blood pressure in the kidney, or by actually stimulating the epithelium of the urinary tubules. Among the former class, the vascular diuretics, may be mentioned such drugs as digitalis, scrophanthus, and squills, which raise the pressure in the arteries generally; and spirit of nitrous ether, turpentine, juniper, copaiba, savin and cantharides, which have mainly a local action affecting the renal blood-vessels. The diuretics which act upon the epithelium belong for the most part to the group known as saline diuretics (certain salts of potassium, sodium, and lithium). Certain of the aromatic oils and oleo resins act, however, in a similar manner.

Divan (Persian, plural of *dir*, God), properly an assemblage of supernatural beings; hence applied to the council of a prince, and transferred, first to the highly ornamented chamber in which such councils were held, and next to a common article of furniture in it—a kind of settee or sofa. It was

also applied to a collection of poems—a use imitated in Europe by Goethe.

Diver, any bird of the genus Colymbus, constituting the family Colymbidæ with three species, all confined to the seas of the Arctic and North Temperate zones. The bill is straight and strong, about as long as the head; nostrils basal; the legs very far back. with three toes all webbed, in front, and a small hind toe; wings short; tail short and rounded. All live out at sea, except during the breeding season; they are strong on the wing, and dive with great ease, pursuing fish. on which they feed, under water. The great Northern Diver, Loon, or Ember Goose (*C. glacialis*), which generally breeds in the Arctic regions, coming southwards in winter, when it is not uncommon on our coasts, is from 30 in. to 36 in. long. The head is black with metallic lustre, cheeks and back of neck dull black; back black, spotted and streaked with white, the markings becoming longer towards the breast; neck and upper part of breast white with black spots, and two rings of black: breast and abdomen white. Immature birds are greyish black above and dull white beneath. *C. arcticus*, the Black-throated Diver, is about 26 in. long, and is boldly barred with black and white on the back and tertiaries; the back of head and neck light ash, chin and throat black. It is a common water visitant. and sometimes stays to breed in the northern parts of Great Britain. *C. septentrionalis*, the Red-throated Diver, about 24 in. long, brownish-grey above, white below, with a conical red patch on the throat, is common in the estuary of the Thames. It may often be seen pursuing shoals of sprats, whence it is called the Sprat Loon, and in Scotland, where it is considered to be a harbinger of bad weather. it is known as the Rain Goose. Sometimes the term Divers is used so as to include penguins, puffins, grebes, etc., and then the species of Colymbus are called Northern Divers.

Dividend (Lat., *dividendum*, to be divided), the sum available as net profits for division among the shareholders of a railway, bank, or trading company annually, or at such other times as may be fixed. Varying with the profitableness of the enterprise, it must be distinguished from interest on debentures, which is fixed, and no part of which is "earnings of management" in the economic sense. Also, the sum available from a bankrupt's estate to be divided among his creditors in part payment of their claims.

Dividing Engine, a machine for engraving or otherwise marking linear and angular scales. The cutting edge is generally controlled by an accurately turned screw-thread, by means of which the cutter is ranged along the scale at equal distances, and made to mark off a straight line in each position.

Divi Divi, the commercial name for the pods of *Cæsalpinia coriaria*, a small leguminous tree, native of Northern Brazil, Venezuela, Mexico, and some of the West Indian Islands. The pods are 2 to 3 inches long, ¾ inch broad. flattened, twisted in drying like the letter **S**, and of a rich brown colour. The large percentage of tannin they contain makes them valuable in tanning and in dyeing. They are chiefly exported from Maracaibo.

Divination, the act or art of predicting future events or of discovering hidden or secret things by supernatural power. The belief in divination is founded on the idea of the continuity of human life beyond the grave, and on the existence of spiritual beings more powerful than mortals, even though the idea of a Supreme Deity may not have been reached. But from the earliest times of which we have written record down to the present day, in every land there has been a striving after knowledge that transcends sensible things, and that cannot be acquired by ordinary means. In the opening chapter of his inquiry into this subject (*de Divin.*, i. 1) Cicero tells us that all nations believe in divination of some kind, and that it would be an excellent thing if one could be sure that divination really existed, for by it human nature would approach as nearly as possible to the power of the gods. And then, as a Roman, he glories in the name *divination* as derived from the Latin word *divi* = "the gods"; while the Greeks, he says, call it *manteia*, from the same root as *mania* = "madness." Yet when one considers that madness was formerly supposed to be the result of possession by spirits, the superiority of the Roman to the Greek name is not so evident. [Animism.] No better example of the supposed connection between possession and divination can be found than Acts xvi. 16. Divination is generally reckoned as of two kinds—(1) *Natural*, or *subjective*, in which the divine will is directly impressed on the mind of the diviner; and (2) *Artificial*, or *objective*, in which the divine will is conjectured from something external to the diviner. The first form is distinctly religious, and there are countless examples of it in the higher faith. In classic times, oracles, dreams, and ecstasies were the means by which the will of the gods was directly revealed to men; and this method of communication led to the formation of a class of persons who received these messages for, and interpreted them to, their fellows. Fraud crept in in process of time, as was inevitable; but the foundation on which the theory of divination was built was faith. As Professor Rhys says, in his *Hibbert Lectures*, "Zeus was the source of all divinations; the rustling of the wind in the leaves of the sacred oaks at Dodona, the voices of the waves, and the bubbling of the spring near the sacred oak, were all held to be oracular; and even in the case of the celebrated oracle of the Pythian Apollo, at Delphi, the latter was no more than the *prophetes*—or mouthpiece, so to say—of Zeus." In the Hebrew Scriptures the term "divination" is used for the most part of dealings with the gods of the heathen nations; but there are many examples among the chosen people of what present-day writers can call by no other name. Thus, Joseph dreamed prophetic dreams (Gen. xxxviii. 5–11), and interpreted the dreams of others (Gen. xl., xli.), as also did Daniel (Dan. ii., iv.), and both asserted that their interpretations were from God. In the New Testament, also, Joseph, the spouse of Mary, had revelations from God in dreams (Matt. i. 20; ii. 12, 19–22). We read in the Old and New

Testament of lots being drawn by divine command; from above the Mercy Seat Jehovah revealed his will; and in the days of Samuel (2 Sam. xvi. 23) it had become an oracle. Moreover, there was the line of prophets inspired to declare the divine will to the children of Israel, so that the diviners against whom the denunciations of Scripture are directed are evidently those of the Gentiles. Analogy or symbolism lies at the root of *artificial* or *objective divination;* and though this may be hidden from us, to those who used the rites it was real enough. Few now can understand Bunyan's wishing to stake his salvation on his power to cause the puddles in the road between Elstow and Bedford to dry up; Elijah would have understood it and sympathised with it (cf. 1 Kings xviii. 23). The principal forms of artificial divination were:—*Aeromancy*, from appearances in the sky; *aleuromancy*, by meal; *astragalomancy*, by dice or huckle-bones; *belomancy*, by the flight of arrows (Ezek. xxi. 21; 2 Kings xiii. 15–19) [Robin Hood is said to have chosen his burial-place in this way]; *bibliomancy*, by opening a book at random, and drawing conclusions from the passage which meets the eye; *botanomancy*, by writing on leaves; *capnomancy*, by the movements of smoke; *cartomancy*, by writing on paper; *catoptromancy*, by mirrors; *cheiromancy*, by lines on the hands [Palmistry]; *ciromancy*, by the melting of wax; *cleromancy*, by lots; *coscinomancy*, with a sieve and shears; *crystallomancy*, by looking into a crystal, as did the famous Dr. Dee; *dactylomancy*, by the fingers; *demonomancy*, by the suggestions of evil demons, or devils; *geomancy*, by lines drawn on the ground; *gyromancy*, by circles; *hepatoscopy*, by inspection of the liver (Ezek. xxi. 21)—this was, however, but one form of the *haruspicatio* of the Romans, which was based on the appearance of the entrails of sacrificial victims; *hydromancy*, by water; *idolomancy*, by idols or figures; *lithomancy*, by stones; *machæromancy*, by swords and knives; *necromancy*, by apparitions of the dead; *oneiromancy*, by dreams; *oinomancy*, by wine; *onomatomancy*, by names; *onychomancy*, by marks on the nails; *pyromancy*, by fire; *rhadomancy*, by a rod or staff [Divining Rod]; *scapulomancy*, by lines on a shoulder-blade that has been partly burnt; *sciomancy*, by shadows; and *theriomancy*, by wild beasts. [Augur, Demonology, Dreams, Omens, Oracles, Magic, Witchcraft.]

Divine Right, in English history, the right claimed by the king to rule as the vicegerent of God on earth, independently of the will of the people. The doctrine, though contrary in principle to the traditions of the English constitution, seems to have grown up throughout Europe partly from misapplied maxims of Roman law (*see* Allen, *Royal Prerogative*), partly from the transfer to mediæval kings of the attributes of the Hebrew kings of the Old Testament, and the use of a similar ceremonial at their coronation. The rise of the Tudor monarchy after the practical extinction of the old nobility in the Wars of the Roses, gave the theory a chance of practical application. But it never took root in the English mind. An elaborate exposition of it by Sir Robert Filmer in his *Patriarcha* (written before 1648) bases it on the doctrine that the king of a nation represents Adam and Noah, to whom God granted the earth, as recorded in Genesis, and that he inherits their dominion by primogeniture (a divine law), and rules the nation as a father rules his family. This absurd form of the doctrine was demolished by Locke, but it lingered on through the next century, and doubtless is now held by Legitimists. The power of "touching for the king's evil" (for which a form of service existed in the English Prayer Book as late as 1719) was ascribed to the king in virtue of his divine right as early as the reign of Edward the Confessor.

Diving, the art of immersing one's self in, and remaining under, water for limited periods. It is pursued with or without the aid of artificial appliances. The chief difficulties to be contended

DIVERS.

with are lack of air and pressure of water, the latter, even at slight depths, being considerable, and at great ones terrible. A practised naked diver has been known to subsist under water for a little over two minutes, but the time is, of course, insufficient for the performance of much work; and, to enable divers to prolong it, many devices have been made use of. The earliest of these is the Diving Bell, a strong vessel usually made in the form of a truncated cone, with the smaller and upper end closed and the lower one open. It is so suspended that, when lowered into the water with the diver inside it, it may sink full of air, and with its base parallel with the horizon. The air hinders

the rise of water within, though the deeper the apparatus, the greater the pressure, and consequently the higher the rise. At thirty-three feet, when the pressure of the water equals that of the atmosphere, the bell becomes half full. To keep the water within limits, air under pressure is generally pumped into the bell. The diving bell was perfected by Spalding and others, but as its arrangements prevented the diver from going far away from it, it has, save for particular purposes, been generally superseded by one or other of the numerous forms of diving suits and helmets. The first diving suit seems to have been invented by Borelli. The principle, in its simplicity, is the placing of the diver's head in a water-tight chamber or helmet into which supplies of fresh air are continually pumped from above, the foul air being at the same time allowed to escape by means of a tube or a valve. The helmet is fitted with glass eyeholes. The bare principle has been developed in many directions. To some helmets are now attached reservoirs of compressed fresh air, which are placed under the control of the diver. Such is the apparatus of Rouquairol. Fleuss's helmet is connected with a portable supply of compressed oxygen, and arrangements are made whereby the air that has been breathed by the diver is purified by being passed through a solution of caustic soda. The wearer of such a helmet is, for a time, independent of communication with a boat or with the shore.

Divining Rod, a forked twig, usually of hazel, "commonly called Moses' rod, which, freely held forth, will stir and play if any mine be under it." So Browne defined it, wisely adding "we are of opinion that it is a fruitless exploration." It was, and indeed still is, also employed to discover hidden springs, and remarkable stories are told concerning it, which are, however, capable of explanation without attributing occult power to the rod or the operator. The rod is laid lightly in the open hand, or held by the forks between the balls of the thumbs, and as the operator walks over the spot where the mineral or water is to be found, the rod is said to incline toward the object of search.

Divisibility, that property of matter which enables it to undergo extreme subdivision without loss of its distinctive qualities. In modern chemical theory infinite subdivision is regarded as impossible. A stage is reached with any substance beyond which further division will give us particles of new type. When this stage is reached the substance is said to have its constituent molecules isolated. Further division of each molecule will give atoms of matter, of like or unlike kind. An atom may conceivably be cut, but a portion of an atom would not possess the properties of matter—in perhaps the same way as a portion of a smoke-ring would not exhibit the curious characteristics possessed by the complete ring. The extent to which subdivision may be carried is readily instanced by many mechanical processes. A pound of cotton may be spun into a thread eighty miles long, the diameter of the thread being then only $\frac{1}{3\,5\,0}$th of an inch. Lines have been engraved on glass for certain optical purposes, so close to one another that 20,000 are ranged to the inch. A skilful gold-beater can hammer out this extremely malleable metal to a thickness of $\frac{1}{3\,0\,0\,0\,0\,0\,0}$th of an inch, and by a simple mechanical process a layer of gold may be deposited on white satin or ivory of a thickness not exceeding the ten-millionth part of an inch. A fibre of spider-web is only $\frac{1}{3\,0\,0\,0\,0\,0}$th of an inch in diameter, but Professor Boys has devised an ingenious method for obtaining quartz fibres that are far thinner. The fact that the marble steps leading to many sacred shrines are so little worn away in the course of centuries by the feet of innumerable pilgrims give some idea of the slightness of the rubbing at each contact. That certain substances such as iron, musk, or lavender possess distinct effluvia shows that they must be emitting particles continually. A single grain of musk will give a distinct perfume to a room for over twenty years. An estimate of the number of particles that must have been emitted in that time to produce the observed effect can only be rough; nevertheless, it is safe to say that the number must be estimated in quadrillions. Numerous instances can be adduced in the case of liquids, but the above are sufficient to illustrate the astonishing tenuity of matter that can be attained before the atomic limit is reached.

Division, a process in arithmetic, the converse of multiplication. It cannot be performed without a knowledge of the latter, and is essentially a systematic guess-work. Thus in dividing 37 by 13 we have first to hazard a possible answer and then see if it is right by direct multiplication. This uncertainty is diminished by experience with the *divisor* or number by which we are dividing, but is generally manifest when such a number contains several digits. The number divided is called the *dividend*, the answer is the *quotient*.

Divorce, the judicial dissolution of the marriage tie. It may be obtained at the instance of either husband or wife; but they are not upon an equal footing as to the grounds upon which it will be granted, for in the case of the husband seeking divorce it is grantable to him on his proving the adultery of his wife only, whereas in the case of the wife she must not only prove adultery but also cruelty or desertion for two years, or incestuous or bigamous adultery, or an unnatural offence, against her husband. The proceedings for a divorce are commenced by a petition addressed to the President of the Probate, Divorce, and Admiralty Division of the High Court of Justice. The rules and orders issued under the Judicature Acts do not apply to divorce proceedings or to proceedings for a judicial separation, and the practice in these matters is the same as it was under the old Court for Divorce and Matrimonial Causes. Every person petitioning for a divorce must set forth concisely the particulars of his or her case and the alleged conduct of the respondent or respondents in detail, and the petition must be accompanied by an affidavit verifying the facts therein alleged so far as they are within the petitioner's *personal* knowledge, and stating that there is no collusion or connivance between the deponent and the other party to the marriage.

And on a petition for divorce presented by a husband, he must, unless excused by the Court on special grounds, make the alleged adulterer a co-respondent. It is also required that every petition shall be served on the party to be affected thereby, and after such service the next step is to issue a citation which, as a rule, must be personally served, and is in effect a writ of summons to the respondent or co-respondent, subject to the rules specially promulgated for proceedings in the Divorce Court. An appearance is then entered by the respondent or respondents, after which the answer, verified by affidavit, is filed in the Registry and, if necessary, further pleadings take place between the parties. With reference to the trial the judge will himself, on application, as soon as the pleadings are ended, direct whether the action shall be tried by a jury or before the Court itself, and whether by oral evidence or by affidavit; but in case of divorce the trial must be in open Court and not in camera, and either party may insist on a jury, whose intervention also is necessary in all cases in which damages require to be assessed against an adulterer. [ADULTERY, JUDICIAL SEPARATION.]

Dix, JOHN ADAM (1798–1879), an American statesman and general, born at Boscawen, in New Hampshire. He became a soldier at fourteen, and distinguished himself in the war against England in 1812. His father—Colonel Dix—was killed in the battle of French Mills. After sixteen years' service in the Artillery the son came to New York, and became an advocate. He was in Congress and in the Senate 1845–49. He was opposed to the extension of slavery and advocated free trade. In 1861 he became Buchanan's Financial Secretary of State. He joined the War of Secession as major-general, and displayed much energy in Maryland and Eastern Virginia. In 1863 President Lincoln summoned him to New York to suppress the Conscription Riots. He was French ambassador 1866–1869, and governor of New York State 1872–74. He is not unknown as a writer.

Dixon, WILLIAM HEPWORTH (1821–1879), an English author, was born at Manchester. In 1849 he published a sketch of the life of Howard the philanthropist, in 1851 one of William Penn, and in 1852 one of Admiral Blake. In 1853 he became chief editor of the *Athenæum*, and in the following years, besides his work upon this, he published the *Personal History of Francis Bacon* (1862), *The Holy Land, New America* (1867), and *Spiritual Wives* (1868). Upon retiring from the editorship of the *Athenæum* in 1869, he went on writing works of history, travel, and fiction. Of this period are his *Free Russia, Her Majesty's Tower, The Switzers, The History of Two Queens* (Catherine of Aragon and Anne Boleyn), and, his last work, *Royal Windsor*. His two novels, *Diana Lady Lyle* and *Ruby Grey*, are also of this period.

Dizful, a Persian town, near the western boundary of the country and upon a river of the same name. It has a considerable trade, and many manufactures.

Djezzar, AHMED (1720–1804), an eastern ruler, born in Bosnia. He is said to have sold himself to Ali Bey in 1755, and he became successively a Mameluke, Governor of Cairo, and Governor of Beyrout in 1873. In 1875 he was Pasha of St. Jean d'Acre, and he subdued Syria in spite of the remonstrances of the Turkish Government. It was at this time that he earned his name, which means "the Butcher." In 1799 he defended St. Jean d'Acre against the French forces.

Djinn. [JINN.]

Dnieper, THE, a river of Russia, anciently the Borysthenes. Next after the Volga and the Danube, it is the largest river in Europe. It rises in the Lake Mchara in the government of Smolensk, and flows S.W., S.E., and S.W. into the Black Sea. With a length of 1,230 miles, it is navigable to a little above Smolensk, and receives among other tributaries the Beresina, Desna, Pripet, and Psiol. The Oginski canal unites it with the Niemen, that of Horodetz with the Vistula, and that of Beresina with the Duna. There are important fisheries in its lower course. Between Kiev and Alexandrovsk are a series of cataracts, which necessitate a portage of 30 miles, but these are in process of removal by blasting. A service of steamboats has existed since 1838, and there is much trade. The only bridge is at Kiev, and this is taken away during the freezing up of the river in winter.

Dniester, THE (anciently the Tyras), rises in the Carpathian Mountains, in Austrian Galicia, and flows N.N.E. and S.E. into the Black Sea, entering Russia at Chotin. It has a course of 750 miles. The navigation is much impeded by shallows and rapids. The water is muddy and unwholesome, but full of fish.

Doab (lit. two waters) is a generic name much used in India. The space between the Ganges and the Jumna is specially called *the* Doab, but the Punjab—the land of five rivers—has five Doabs.

Dobell, SYDNEY (1824–1874), an English poet, was born at Cranbrook, in Kent. His first poem, *The Roman*, was well received upon its appearance in 1850. Other of his works are *Balder*, *Sonnets on the War*, *England in time of War*, etc.

Döbeln, a town in the kingdom of Saxony, 40 miles S.E. of Leipzig. The town is built upon an island in the Mulde, and has a large trade in grain, and manufactures of cloth, yarn, leather, lacquered ware, etc.

Dobereiner's Lamp, which takes its name from that of its inventor, depends for its action upon the fact that if a jet of hydrogen be allowed to impinge, in air, upon spongy platinum, the gas ignites and the metal is heated to incandescence. The lamp simply consists of an arrangement by which a supply of hydrogen can be readily obtained, the nozzle through which the gas issues being directed upon a support which holds the platinum sponge.

Dobrovsky, JOSEPH (1753–1829), a learned Jesuit, who was born near Raab, in Hungary. He studied at the University of Prague, and became

successively vice-rector and rector of the seminary of Hradisch, near Olmutz. He gave his attention specially to the study of the Bohemian language, literature, and history. He wrote an introduction to a German-Bohemian Dictionary, a system of the Bohemian language, and the plan of an Etymological Dictionary of Slavonic. He also wrote upon the old Slavonic dialects.

Dobrudja, THE, a territory in the S.E. of the kingdom of Roumania, bounded on the N. and W. by the Danube, on the E. by the Black Sea, and on the S. by Bulgaria. It was assigned to Roumania by the treaty of Berlin on the 13th July, 1878. A railway of 59 miles from Tchernavoda to Kustendje is on a road, made in 1855 by the French Government, from the Black Sea to the Danube. The chief industries are the rearing of sheep and beasts, the keeping of bees, fishing, and the manufacture of salt. The population is very varied, containing among others Roumanians, Bulgarians, Tartars, Cossacks, Greeks, Turks, Jews, and Germans. The capital is Babadagh.

Dobson, WILLIAM (1610–1647), an English painter, who benefited by the advice of Vandyke, whose manner he in some degree approaches. He was brought to Court, and painted portraits of Charles I., the Prince of Wales, Prince Rupert, and many of the courtiers.

Dobson, WILLIAM CHARLES, R.A., was born in 1817. He showed an early taste for art, and after studying at the British Museum, entered as a student at the Royal Academy in 1836. In 1843 he was appointed headmaster of the Government School of Design at Birmingham. This post he resigned two years later, and went to Italy and Germany to study. He became A.R.A. in 1860, and R.A. in 1873, being also a member of the Society of Painters in Water Colours.

Docetæ (Gk. *dokein*, to seem), a name given to a section of the Gnostics, who believed that the body of Christ was a mere appearance, or phantom. They thus denied the reality of the Crucifixion, the Resurrection, and the Ascension, and virtually the Atonement. The doctrine arose from the Neo-Platonist view that matter was essentially impure; hence, it was argued, a Divine Being could not have taken on Himself a material body. Saturninus, Marcion, and Tatian were among the leaders of the sect.

Dock, an artificial basin, divided from sea or river, especially if the waters be tidal or subject to fluctuation, by water-tight gates. The object of a wet dock is to secure a depth of water wherein ships may float alongside of a wharf or quay independently of tides, currents, and freshets; and these docks are designed to assist the prompt and safe completion, repair, loading and unloading of vessels. Dry docks are docks which, after ships have been admitted into them, can be emptied of water, leaving the vessels completely exposed for examination or repair. The mouth of such a dock is usually closed by a gate similar to a lock gate, or by a caisson. The London Docks were opened in 1805, the West India Docks in 1802, and the East India Docks in 1806. These are mainly wet docks. The largest dry docks in England are in the royal dockyards.

Dock, the name commonly applied to a section of the genus *Rumex*, insipid herbaceous plants, many of them well-known weeds in grass land. The leaves are pinnately veined and rounded at the base; the flowers are in whorls and are generally perfect, with a six-leaved perianth, six stamens, and three styles. The nut-like little fruit is three-cornered, and superior.

Dockyard, an arsenal of nautical stores and materials of all kinds, wherein ships may be built or repaired, moored, fitted, and commissioned. The royal dockyards in the United Kingdom are at Portsmouth, Devonport, Chatham, Sheerness, and Pembroke, and there is also a yard available for certain purposes at Haulbowline, Queenstown, and there were formerly yards at Deptford and Woolwich. Abroad there are also British naval dockyards at Gibraltar, Malta, Halifax, Jamaica, Bermuda, the Cape of Good Hope, Ascension, Trincomalee, Hong Kong, Esquimalt (Vancouver's Island), and Sydney. Deptford was established in the time of Henry VIII.; Woolwich, about 1509; Chatham, in the reign of Elizabeth, and, on its present site, about 1622; Sheerness, about 1661; Portsmouth in the reign of Henry VIII., if not before; Devonport, or Plymouth, prior to 1691; and Pembroke in 1815, prior to which year it had been a temporary yard. Portsmouth is now the most important naval dockyard in the world. It contains twenty-four dry docks, or locks and basin entrances which may be used as such, enormous basins, storehouses, factories and machine works; and it could, in case of necessity, accommodate in dry dock a ship 650 feet long and nearly 80 feet broad. Owing to their importance as headquarters of the fleet, all the royal dockyards are strongly fortified. The French naval dockyards are at Toulon, Cherbourg, Brest, L'Orient, and Rochefort; the German at Kiel and Wilhelmshaven; the Italian at Naples, Spezia, and Venice; the Austrian at Pola and Trieste; the Russian at Cronstadt (St. Petersburg), Sebastopol, and Nicolaieff; and those of the United States at Brooklyn (New York), Charlestown (Massachusetts), Gosport (Virginia), Kittery (New Hampshire), League Island (Pennsylvania), Mare Island (California), New London (Connecticut), Pensacola (Florida), and Washington.

Doctor (Latin *a teacher*), a university degree, originally an alternative title to that of master [DEGREES], and said to have been first conferred in the faculty of laws at Bologna in the twelfth century. It was conferred in Paris about 1150, and in the first half of the next century in England. The absence of the degree in the faculty of arts in England, and its comparative rarity in those of law and divinity, have tended to make the term a popular synonym for "medical man." Many of these, of course, have strictly no claim to the title. In Germany and some American universities the degree of "Doctor of Philosophy" (Ph.D.) exists for graduates in arts (literature or science). London University grants the degrees of Doctor of Science

and Doctor of Literature; and Cambridge has recently introduced a Doctorate of Science and one of Letters, which are reserved for men of very high eminence. Ph.D. is not usually taken in Germany save by those who take up learning as a profession.

Doctors' Commons, originally a society of civil and canon lawyers in London, licensed to practise in the ecclesiastical courts of the province of Canterbury. In 1567 the then Dean of Arches, Henry Harvey, purchased a site for them on St. Benet's Hill, near St. Paul's Cathedral. On this were built the Ecclesiastical and Admiralty Courts, as well as houses for the Vicar-General, the Chancellors, for the Archbishop of Canterbury, and the Bishop of London, and the members of the society. This was incorporated by Royal Charter, the president being the Dean of Arches for the time being, and the members all Doctors of Law of Oxford or Cambridge as were licensed to practise in the Ecclesiastical Courts. There were also licentiates, or proctors, licensed to practise, who may be remembered by readers of *David Copperfield*. In 1857 the Corporation was empowered by Act of Parliament to sell its estate, and dissolved; and ecclesiastical practice is now open to all members of the bar. Some of the legal business of the province of Canterbury is still transacted on the old site.

Doctrinaire, in *Politics*, strictly speaking a man who holds fast to abstract doctrines in all circumstances. Thus most of the French revolutionist leaders might be called doctrinaires. But the term was invented by the ultra-royalists in France just after the Restoration of 1814, and applied to a moderate Liberal group headed by Royer Collard (q.v.), and including at various times the Duc de Broglie, MM. Camille Jordan, Guizot, and others. This group professed to base their principles on the study of French history, and attacked both the revolutionists for their contempt of the past and the royalists for their reactionary tendencies. They have thus been treated as an offshoot of the great movement towards the study of history as a development, which began early in this century. Politically their doctrines might be called moderate Liberalism, at least relatively to those of the ultra-royalists. They supported constitutional monarchy and parliamentary government, but they opposed extension of the franchise, disapproved of a free press, protested against the notion that parliament should represent the views or wishes of the nation, and held that the king should govern as well as reign. Probably, therefore, they did more harm than good to the cause of constitutional monarchy in France. Louis Philippe's government more or less represented their views. After its fall in 1848 they disappeared from public life. The Orleanists carry on their traditions.

Dodd, WILLIAM, LL.D. (1729–1777), an English clergyman, born at Bourne in Lincolnshire, and educated at Clare College, Cambridge, and chiefly remembered because he was hanged for forgery. He was chosen by the Earl of Chesterfield as his son's tutor, and afterwards he won renown as a London preacher, and became chaplain to the king in 1766. Speculation in proprietary chapels seems to have landed him in financial difficulties, and in an ill-advised moment he forged his patron's (the Earl of Chesterfield's) name. In spite of powerful intercessions the sentence of death was carried out. Dr. Johnson took much interest in his fate. Among Dr. Dodd's literary works are *The Beauties of Shakespeare*, *A Commentary upon Milton*, and *Thoughts in Prison*.

Dodder, the popular name of the genus *Cuscuta*, some fifty species related to the Convolvulaceæ, all of them natives of temperate regions, and annual, leafless, twining parasites. Their seed is albuminous, and the embryo spiral and thread-like, with hardly a trace of cotyledons. It germinates in the ground, and on coming in contact with the stem of a herbaceous plant sends out sucker-like branches or *haustoria*, penetrating the cortical and bast-tissues of the host, while it coils round it like a tendril. It then loses all connection with the ground and grows rapidly into a tangle of red thread-like stems, containing hardly any chlorophyll, but bearing numerous clusters of small 4 to 5-merous flowers, succeeded by two-chambered capsular fruits containing four minute seeds. Several species are destructive to flax and clover crops, their seeds being sown with those of the crop.

Doddridge, PHILIP, D.D. (1702–1751), an eminent Noncontormist minister, was born in London. The Duchess of Bedford offered her influence on his behalf if he would become a Church of England clergyman, but he declined, and joined a Nonconformist body, and was for twenty-two years a pastor at Northampton. He wrote many hymns and treatises, and his *Rise and Progress of Religion in the Soul* and his *Family Expositor* are well known by name. He also lectured upon many subjects. He went to Lisbon in search of health, and there he died. He was not bigoted, but allowed the use of cards and tobacco.

Dodgson, CHARLES LUTWIDGE, an English writer, better known as "Lewis Carroll." Born in 1833, he was educated at Christ Church, Oxford, where he graduated as B.A. in 1854, afterwards taking orders and becoming Senior Student of Christ Church: he is a distinguished mathematician. His *Alice's Adventures in Wonderland* in 1865 achieved a wonderful success, as did his *Alice Through the Looking-Glass* in 1872. These works have been translated into many languages, and there are few, young or old, who are not familiar with "The Cheshire Cat," "The Duchess," "The Mock Turtle," and "The Jabberwock." *Alice's Adventures* have been successfully produced upon the stage. Other writings of the same author are *The Hunting of the Snark*, *Phantasmagoria*, *Euclid and his Rivals*, *A Tangled Tale*, and *Game of Logic*, *Sylvie and Bruno*.

Dodington, GEORGE BUBB (1691–1762), originally Bubb, he took the name Dodington upon inheriting some property in 1720. In 1715 he entered Parliament, and sat for Bridgwater from 1722 to 1754. Beyond his diary he is chiefly known for his fickleness, but he has the merit of having spoken

out on behalf of Admiral Byng. He became Baron Melcombe before his death.

Dodo (*Didus ineptus*), a large bird allied to the pigeons. It was abundant in Mauritius, to which it appears to have been confined, but became extinct towards the close of the seventeenth century, within a little less than forty years after the colonisation of the island by the Dutch. The fact that it was excellent eating was perhaps the chief factor in its extermination, but the dogs, pigs, and cats introduced by the colonists largely contributed to

DODO (*Didus ineptus*).

this result, for many of them became more or less feral and fed on the eggs and the young birds. The dodo—from the Portuguese *doudo* (= stupid), the name given it by the discoverers of Mauritius—was a heavy, helpless bird, about the size of a turkey, with short stout legs, rudimentary tail and wings and very large bill, the upper mandible hooked at the point. The plumage was shades of grey, with some yellow on the wings and tail. Some specimens were brought alive to Europe, and remains exist in various museums. In 1866 in draining a swamp in Mauritius a large quantity of bones was discovered, and from these the skeleton was practically reconstructed, so that the question of the affinity of the dodo to the pigeon was settled.

Dodona, in Epirus, one of the most famous and most ancient of Greek oracles. It was the seat of Zeus, and the intentions of the oracle were communicated by the rustling of leaves upon the surrounding forest trees, or by the murmur of a brook that sprang beneath a sacred oak, or by the solemn clang of copper vessels suspended from the temple, said to have been founded by a priestess of Egyptian Thebes, who was sold by the Phœnicians to the Greeks. Constantine Carapanos has explored the ruins, and in 1878 wrote a book upon them.

Dodsley, ROBERT (1703–1764), an English poet, dramatist, and publisher, was born at Mansfield. Besides the tragedy of *Cleone* he wrote the famous farce (1736) *The King and the Miller of Mansfield*. He further wrote *Fables in Verse* and an *Essay upon Fables*. He planned the *Annual Register*, which first appeared in 1758. He is perhaps better known for his twelve volumes of old plays and six volumes of poems by different hands. Pope and Chesterfield patronised him, and his early efforts were encouraged by Dr. Johnson.

Doe, the female of the buck (q.v.), and like that word used attributively, of rabbits, goats, etc.

Dofla. [DAFLA.]

Dog, the book name for any species or individual of the family Canidæ, constituting the Carnivorous division Cynoidea (q.v.). The term is also used for any variety or individual of *Canis familiaris*, the Common or Domestic Dog, the principal breeds of which are described in separate articles. The division Cynoidea partakes of the characteristics of the other two [ÆLUROIDEA, ARCTOIDEA], and the three (Cats, Dogs, and Bears) make up the family Carnivora. In the Cynoidea there are five digits on each of the fore, and four on each of the hind limbs, except in the Cape Hunting Dog; and these animals walk on the tips of their toes like the cats, not on the sole of the foot, as do the bears. A rudimentary hallux or "dew-claw" is often present in the domestic dog. The claws are not retractile, though the ligaments which draw them back in the cats are present. Owing to this the mode of attack in the two groups (Dogs and Cats) is essentially different. The cats strike down their prey, the dogs seize it with their teeth. The distinction will be clear to anyone who has seen a domestic cat and a terrier tackle a rat, and the action of the smaller forms is identical with that of the larger ones. The dental formula is usually the same as that of the bears, and some of the molar teeth are adapted for grinding. The diet is for the most part carnivorous, but many of the smaller forms eat carrion, insects, fish, crustaceans, and vegetable substances. They are very widely distributed, being absent only from Madagascar, the Antilles, Austro-Malaya, New Zealand, and the Islands of the Pacific. Their senses are well developed, that of smell in an extraordinary degree. Many of the wild forms in various parts of the world hunt in packs, and show great pertinacity in running down their prey. The period of gestation is nine weeks; the young, usually from four to eight in number, are born blind, and continue in that state for nearly a fortnight. The mother is an affectionate parent, but the sire is entirely neglectful of his offspring. Following Professor Huxley, the family may be divided into two groups, with two aberrant members—(1) The *Thooid* or *Lupine* section, containing the Wolves, Jackals, and the Dogs proper, so-called wild, and domesticated [DINGO, DHOLE, JACKAL, WOLF]; and (2) The *Alopecoid* or *Vulpine* section, containing the Foxes and fox-like forms. [FENNEC, FOX.]

The Dog (*Canis familiaris*) has been known from a very remote period. Its remains are found in the Kitchen-middens of the Neolithic period; and on Egyptian monuments "from the fourth to the twelfth dynasties (*i.e.* from abont 3400–2101 B.C.) several varieties of the dog are represented." But the origin of the race is lost in obscurity, though Darwin's opinion that "the breeds of the domestic dog throughout the

world are descended from several wild species" is generally accepted as well as his conclusion, of which there is practical proof, that some are due to selection on the part of the breeder. [BREED.] The probability of his theory is shown by the fact that savages so far apart as the Eskimo and the Australian have reduced wild dogs to domestication, and the former have trained them as draught animals. In wild dogs the ears are erect and pointed and the tail is straight; in the domestic dog the former generally droop, and the latter is curling. The only constant difference, however, is the habit of barking, which is only acquired after long association with man. The domestication of the dog is of vast importance to man, for it has given him not only a faithful servant but an attached companion and a devoted friend; and long training and intercourse with man has so developed the intellect of this animal that some of the stories told of its feats would not be credited did they not rest on the best authority. On the continent of Europe the dog is used in many places for draught, but this is illegal in the United Kingdom. In China its flesh is eaten and is said to be well flavoured, and in Manchuria dog-farms exist where these animal are bred for the sake of their skins, which are used as robes.

The Cape Hunting Dog (*Lycaon pictus*) from South and East Africa is about the size of a mastiff, with large erect ears and drooping tail. In its markings it bears some resemblance to the Spotted Hyæna (*Hyæna crocuta*), whence it is sometimes called the Hyena-Dog. It hunts in packs, but not infrequently feeds on carrion.

The Long-eared Fox (*Otocyon* or *Megalotis lalandii*), from South Africa, is scarcely as large as a fox, with greyish-yellow fur on the upper surface and white beneath. It has six molars more than any other member of the group, two above and one below on each side.

The Racoon Dog (*Canis* or *Nyctereutes procyonides*), from North-Eastern Asia and Japan, has the body covered with long brown fur, the back arched, short slender legs, and short bushy tail. It differs from the true dogs in external appearance only.

Pariah Dogs are feral dogs, met with in troops in most of the towns of the East, where they act as scavengers, and it is probably to animals of this class that the Biblical allusions to dogs refer.

Dog Days, a period of the summer commonly reckoned from about July 3rd to August 11th; by Pliny connected with the rising of the dog star (whether Sirius or Procyon is meant is not clear) which he dates on July 17th. The most unhealthy time of summer frequently, but by no means always, coincides with this period. The ancients attributed great influence over the whole of the animal kingdom to these stars; probably because the heliacal rising of the dog star Sirius, called Sothis by the Egyptians, coincided with the extreme of the overflow of the Nile. Of course the whole notion is a survival of astrological superstition.

Dogars, a Jât people of North-West India, numerous especially in North Rajputâna and the province of Moultan. Small Dogar communities are also met in Hansi, Ferozepore, and along the banks of the Sutlej, where they were the ruling people in the 18th century. The Dogars, though now Mohammedans, claim descent from the renowned Chohan tribe of Rajputs; but they are more probably Aryanised Jâts, and are regarded as such by the Rajputs themselves. They are a pastoral people, at all times much dreaded by their neighbours for their predatory habits. Physically they are tall, muscular, with regular features, large aquiline nose, and pleasant appearance, quite distinct from the Dogras of South Kashmir, with whom they are often confounded. (*See* Elliott, *Races of the North-Western Provinces of India*, volume i.)

Doge (a corruption of Latin *ducem*, acc. of *dux*, leader), the chief magistrates of the republics of Venice and Genoa. In the former the Doge was originally elected by the whole people for life. The first Doge, Paolo Luca Anafesto, was elected in 697. The election was transferred to the Council of Forty [VENICE] in 1172, and the first Doge elected by them was Sebastiano Ziani. The growth of a hereditary aristocracy who monopolised the real power of government practically deprived the Doge of all but ceremonial functions, such as the well-known annual wedding of the Adriatic. At the same time an extraordinarily complicated method of election was introduced. The office was abolished in 1797 on the French occupation. The last Doge was Ludovico Manin. At Genoa, Doges were elected for life till 1528, afterwards for two years only.

Dogfish, any species of Scyllium, the type of a family (Scylliidæ) of Cartilaginous Fishes from temperate and tropical seas. They are small sharks with two dorsal fins, an anal fin always present, a distinct spiracle, and have no nictitating membrane. The species of the type-genus live near the bottom, feeding on dead fish and on crustaceans, though they are by no means particular in their diet. Two species are British: (1) *S. canicula*, the Rough Hound, or Lesser Spotted Dogfish, about two feet long, rufous gray, spotted with brown above, and yellowish below; and (2) *S. catulus*, the Nurse Hound, or Larger Spotted Dogfish, somewhat like the former, but of larger size, and with larger markings. The eggs are deposited in oblong horny capsules, locally known as mermaids' or sailors' purses, with a long filament at each corner, which moor the egg-case. The flesh of these fish is dry, though it is sometimes eaten. *Pristiurus melanostoma*, the Black-mouthed Dog, is also British. The Spiny Dogfishes belong to the genus Acanthias. *A. vulgaris*, the "Picked" dogfish, so called from its spinous dorsal fins, common on our coasts, is viviparous. It is detested by fishermen for the damage it does to their nets and lines, and for its ravages among food fishes.

Dogger, a bluff vessel of Dutch origin, chiefly used for fishing, fitted with a main and mizen mast, and somewhat resembling a ketch. It is so named because it is most commonly seen on the Dogger-bank, the great fishing ground in the North Sea.

WOLF
ESQUIMAUX
DHOLE
DINGO
JACKAL
FOX

Doggerbank, a sand-bank of the German Ocean, renowned as a favourable spot for cod fishing. It begins about 36 miles N.E. of Flamborough Head, and stretches E.N.E. to within 60 miles of Jutland, and is about 170 miles long, diminishing from a breadth of 65 miles to a point. In the shallowest part it has 9 fathoms of water.

Doggett, THOMAS (died 1721), a popular actor born at Dublin, and chiefly remembered for the rowing-match for Doggett's coat and badge, which is rowed upon the Thames on the 1st of August by six watermen who are in the last year of their apprenticeship. The coat is orange and the badge is the Hanoverian White Horse.

Dogma (Greek *an authoritative opinion, a decree*), in *Theology*, a doctrine accepted as matter of faith, to be received without question as of divine authority. While Protestant theology, however, holds that only that is dogma which can be shown to be Apostolic, and that its proof must be sought solely in the Scriptures, some High Church Anglican theologians would also appeal to tradition; while the Roman Catholic Church holds that the decisions of General Councils of the Church on dogma are authoritative and that the Pope may from time to time so interpret tradition as to declare that certain doctrines are dogmas of the Church. The development and history of Christian dogma, and the interdependence and mutual relations of the articles of the Christian faith, are dealt with by the study known as "Dogmatic Theology," which has been much studied of late years, particularly in Germany. The names of Harnack and Dorner may be mentioned in this connection.

Dogras, a historical people still dominant in Jammu, that is, the outer hills of South Kashmir, skirting the north frontier of Panjâb, and called Dûgar, a contraction of the Sanscrit Dvigartdesh, "Land of the Two Valleys." The Dogras appear to be fundamentally Mongolic Jâts assimilated in speech, religion, and even appearance to the surrounding Aryan populations, with whom they have been in close contact for ages. Chief castes: Rajput, including the Mians and working Rajputs; Khâtri (traders, munshis, etc.); Khatar (peasants); Banya and Krâr (hucksters); Nai (barber); Jiûr (carriers); Dhiyar (smiths); Megh and Dûm (scavengers, charcoal-burners, brickmakers, etc.). The low castes are the direct descendants of the pre-Aryan hill tribes, who were reduced to slavery by the Hindu invaders. Dogri is a Neo-Sanscritic language intermediate between Hindi and Panjâb, and current throughout Jammu; it is written with two alphabets, both modifications of the Devanagari. All the Dogras belong to the Hindu religion, except the Western Chibâlis, who occupy the left bank of the Jhelum, and who are Mohammedans. They are a small people, about five feet four inches high, physically weak, with light brown or almond complexion, jet black curly hair, deep brown eyes, slightly snub nose, and well-formed mouth (Fr. Drew, *Jummoo and Kashmîr*).

Dog-ribs, THE, North American aborigines, who belong to the Chippewayan division of the Athabascan race. [CHIPPEWAYAN.] The Dog-ribs are the Slaves, Slavés and Yellow-knives of the Franco-Canadian and English trappers; but they call themselves Thing-è-la-dtinné, and their domain lies chiefly about the Great Bear and Great Slave Lakes, the latter named from them. In this region the medium of intercourse is the so-called "Slave jargon," a Dog-rib dialect mixed with Cree, Franco-Canadian and English elements. The Dog-ribs, who are so named from the national legend of their canine descent, are amongst the few North American Indians who practise the rite of circumcision. They are largely employed as trappers and carriers by the Hudson Bay Company, which maintains the two important stations of Fort Rae and Fort Simpson in their territory.

Dogs, ISLE OF, or MILLWALL, a peninsula on the left bank of the Thames caused by a sudden bend of the river opposite to Greenwich. The isthmus is crossed by the canal of the West India Docks. The etymology of the name is doubtful, but it is thought to commemorate the lodging there of the King's hounds.

Dogwood, a name commonly applied to the cornel or skewer wood, *Cornus sanguinea*, a common British shrub with purplish-red branches, ovate leaves which turn red in autumn, and flat cymose clusters of white flowers which are succeeded by blackish-purple fruits. The name is also applied to the wood of the alder-buckthorn or berry-bearing alder, *Rhamnus Frangula*, which yields a very superior quality of charcoal for gunpowder.

Dolci, CARLO (1616–1686), a painter of the Florentine school, born at Florence where, too, he died. His subjects consist largely of Saints and Madonnas, and his style has been described as "sweet and melancholy." A French writer calls him "le peintre favori des Anglais." He was a pupil of Jacopo Vignali. His *St. Cecilia at the Organ* and *Herodias with the Head of St. John the Baptist* are at Dresden, *St. Andrew in Prayer* in the Pitti Gallery, and his *Christ on the Mount of Olives* in the Louvre. Bartolozzi has engraved his *Virgin Suckling the Child.*

Dôle, the Roman Dola, a French town in the Jura, formerly the capital of Franche Comté. The town is on the right bank of the Doubs, and near the Rhine and Rhone canal. The chief industries are the manufacture of Prussian blue, hosiery, cast-iron ware, and leather, the rearing of silkworms, and tanning. The town is of great historic interest, once had a parliament and a university, and played an important part in mediæval wars. There are amphitheatres and aqueducts and other Roman remains.

Dolet, ETIENNE (1509–1546), a French writer born at Orleans. He took lessons from the best masters in Paris and Italy, and devoted himself to the study of Latin. He was appointed Secretary of Legation at Venice, and afterwards he studied law at Toulouse. Here he made an enemy of the Parliament, and he went to Lyons where he made fresh enemies by the "hardiesse" and satirical nature of his writings. In spite of the favour of Francis I.,

he was accused of unorthodoxy, and his books were burnt in 1543 by order of the Sorbonne, the "great Ciceronian" himself meeting three years later with the same fate as his books. Among his works were *Two Books of Commentary on the Latin Tongue* (1536–38), *How to Translate from one Language to Another* (1540), *De Imitatione Ciceroniana*, *How to Translate Well*. He translated bits of Cicero and Plato, and intended to translate the whole of the latter author.

Dolgans, a Tatar people of Central Siberia, settled on the Yenissei river between Dudinka and the Katangar river, where they are conterminous with the Ostiaks. In appearance the Dolgans resemble the kindred Yakuts of the Lena basin, and like them speak a pure Tûrki dialect, which shows certain marked affinities to the language current amongst the Tatar populations of Tobolsk, Tuimen and other parts of West Siberia (Seebohm, *Proceedings* of the R. Geo. Soc., 1878). West Siberia was the seat of the ancient Tatar kingdom, many of whose inhabitants were driven east after the Russian conquest, and are now probably represented by the Dolgans of the Yenissei and the Yakuts of the Lena.

Dolgelly, a Welsh town, capital of Merionethshire, near the foot of Cader Idris. It has manufactures of woollens, flannels, and cloths, but is chiefly known for the beauty of the surrounding scenery.

Doliolidæ, a family of Ascidians (q.v.), which are free swimming; they are interesting from their cask-shaped form and as being among the few Ascidians in which the sexes are distinct. *Doliolum* is the type genus.

Doll. The use of dolls as toys goes back to a very early period of human history. In Assyria, in ancient Egypt, in Greece and Rome, dolls were common playthings. They offer a natural stimulus to the maternal instinct in girls; but as boys frequently play with them until they are laughed out of the practice, it is clear that this is an inadequate explanation of their use. They are probably played with rather as an imitation of the familiar actions of the mother or nurse than for any more recondite reason. The immense development of the doll trade in modern times is due chiefly to Parisian taste. Wooden dolls (jointed), indeed, are made as a village industry in parts of Germany and Austria, notably at St. Ulrich, near Botzen, in the Tyrol, where the trade is highly specialised. India-rubber dolls date from about 1845. China dolls and the rag doll of our ancestresses have been largely supplanted by the handsome wax and composition dolls which are chiefly made in France. As an illustration of the elaboration of the doll's wardrobe it may be mentioned that (according to a *Pall Mall Gazette* interview) the trade price of dolls' kid gloves is 3s. 6d. a pair; while court dresses, ball dresses, walking dresses, and toilet appliances of the most elaborate kind—not to mention embroidered underclothing—have replaced the simpler attire of the dolls of past centuries, greatly to the detriment of childish imagination and ingenuity. The question arises who buys all these things? It was stated a few years ago that the finest dolls and the most elaborate dresses find a large sale among grown-up young ladies in Spain, South America, and other Latin countries. The higher education has touched them but little as yet, and they find in dressing their dolls a stimulus and satisfaction to their interest in costume. It is also stated that the best dolls' toilettes are made in Paris, the requisite taste being hitherto unavailable elsewhere. Walking dolls (which are not as yet graceful in their movements) and speaking-dolls are American inventions, while a proposal has been patented for dolls with small phonographs in their chests, so that they will be able to repeat poetry or sing. Notoriously, however, these elaborate dolls which leave nothing to the imagination are not regarded with the human affection which attaches to the simpler dolls of childhood.

Dollar (Ger. *thaler*, perhaps from *thal*, a valley). The usual explanation of the name is that they were first coined in Joachim's Thal, Bohemia, about 1500 or 1512: a less probable etymology connects them with German *theil*, part, Eng. *deal*, distribute, share, because they were regarded as parts of a ducat (q.v.). Originally coined in Germany, the dollar passed to Spain and thence to Spanish America. It was familiar in the British colonies in America before the revolution, so much so that some people kept their accounts in dollars; and was adopted as the legal unit of value by the "Continental Congress" during the American revolution in 1785. In 1792 its weight was fixed by Act of Congress at 371¼ grams of pure or 416 of standard silver. The silver dollar remained the legal unit in the United States till 1873, when the gold dollar of 25·8 grams weight was substituted by Act of Congress. The symbol $ is said to be from the Latin *semis*, half (a ducat), or a combination of the figure 8 (the Spanish dollar being worth eight reals) with two lines borne by that coin to distinguish it from the dollars of other nations.

Döllinger, Johann-Joseph Ignaz von (1797–1891), a German theologian, leader of the Old Catholics. Born at Bamberg in Bavaria, he entered the Church in 1822. His *Doctrine of the Eucharist during the First Three Centuries* caused his appointment as lecturer in Church History at the university of Munich. He represented the University in the Bavarian parliament, and as delegate at the Diet of Frankfort he voted for the separation of Church and State. In 1861 he attacked in his lectures the Pope's temporal power. In 1869 and 1870 he opposed the dogma of papal infallibility. He was excommunicated by the Archbishop of Munich, and three months later was appointed rector of the university. In 1873 he became rector of the Royal Academy of Science. Among his principal works are *The Origin of Christianity*, a *Sketch of Luther*, *Christianity and the Church*, and *Papal Legends of the Middle Ages*.

Dollond, John (1706–1761), a famous English optician. His father, who was a silk-worker in Normandy, came to England as a refugee, and

worked at Spitalfields, where the son worked at optics and science in his little shop. Dollond's chief claim to fame was his invention of the achromatic lens, in spite of Newton's belief that it was impossible to avoid the decomposition to rays owing to refraction. He brought about this improvement by employing a double concave of crown glass and a double convex of flint glass, thus making one lens counteract the refraction of the other. By this means telescopes could be made less bulky and more accurate. Dollond's invention gained for him the Copley medal and the membership of the Royal Society. His son Peter and his nephew George and other members of the family carried on his improvements in optical instruments.

Dolmen. [BARROW.]

Dolomite, named after the French geologist Dolomieu, a double carbonate of calcium and magnesium ($CaCO_3+MgCO_3$), the proportion of the two carbonates varying. It occurs in crystals isomorphous with those of calcite (q.v.), and belonging, therefore, to the Rhombohedral system. Being often stained by hydrous iron-oxide and pearly in lustre, it is known as *brown-spar*, *pearl-spar*, or, from its bitter magnesian taste, as *bitter-spar*. It is harder and heavier than calcite. H = 3·5 to 4·5; sp.gr. = 2·85 to 2·95. It more frequently occurs in a granular massive condition as a rock. As it is associated with rock-salt, gypsum, and other chemical precipitates from inland waters it would seem to have been sometimes so formed. Sodium carbonate may decompose lime salts and cause precipitation of calcium carbonate with some admixture of magnesium carbonate, or bicarbonate of lime may decompose sulphate of magnesia, and throw down first gypsum and then dolomite. Most beds of dolomite, however, are fissured or "cavernous," and the volume of the fissures just corresponds to the shrinkage of 12 per cent. that would result by replacing half the molecules in a pure limestone by carbonate of magnesium, so that probably ordinary organic limestone (q.v.) has been so changed or "dolomitised" by the action of magnesium chloride in sea-water. Dolomite or magnesian limestone forms a useful building-stone, and has been long quarried in the Permian (q.v.) rocks of England. York Minster and the Houses of Parliament are built of it. It is so abundant in the Triassic rocks of the South Tyrol that this mountain system is often known as "The Dolomites." Dolomite only effervesces very slightly with cold acids.

Dolomite Mountains, a range in the Tyrol and North Italy, having the Piave and Rienz on the E. and the Val Rendena on the W. They get their name from the dolomite (q.v.), of which they are largely composed, and they are both interesting and picturesque, presenting a great variety of peaks. The highest points E. of the Adige are Marmolata, about 11,000 feet, and Antelao, 10,710; on the W. is Cima Tosa, 10,420 feet.

Dolphin, a book name for any of the Delphinidæ, a universally distributed family of marine and fluviatile toothed Cetaceans. The True Dolphins constitute the genus Delphinus, in which the jaws, closely set with minute teeth, are produced into a pointed snout or beak. The single blow-hole is crescent-shaped, the pectoral limbs are narrow and pointed, and a dorsal fin is generally present. The genus has the range of the family, and no species exceeds 10 feet in length. The Common Dolphin (*D. delphis*), often miscalled the "Porpoise," is from 6 feet to 8 feet long, greenish black above and white below. They are very active and gregarious, and are often met with at sea gambolling round the bows of ships. They feed on fish, jelly-fish, and crustaceans, and their flesh was formerly considered a delicacy. This species is noted in classic mythology, and is borne as a heraldic charge. [CORYPHENE.] *D. tursio*, the Bottle-nose Dolphin, has the beak less prolonged; *D. albirostris* and *D. leucopleurus*, the White-beaked and White-sided Dolphins, occur in the North Atlantic; *D. sinensis*, from the Chinese seas, is milky-white; and a species from the South Seas (*D. peronii*) has no dorsal fin. [BELUGA, CAAING WHALE, GRAMPUS, NARWHAL, PORPOISE.]

Dom, the collective name of numerous low-caste communities in many parts of India and Kashmir; are mentioned in the Hindu writings, and are by many supposed to be the original stock of the European gipsies, whom they closely resemble in appearance, habits, and speech. *Dom* appears to be the same word as *Rom* (*d* and *r* interchange in many linguistic families), the root of *Romani*, the name by which the gipsies call themselves, and which in their language means "man," though by some writers connected with the Sanscrit *doma* (*domba*), a strolling minstrel. The Doms undoubtedly represent a pre-Aryan, possibly even a pre-Mongolic black element in India, and those of the Kumaon district (Himalayas) are described as having "curly hair inclining to wool and being all extremely black" (Traill, *Asiatic Researches*, vol. xvi. p. 160). But no trace of their primitive language has survived, and even before the gipsy migrations westwards all the Doms had already been Aryanised in speech. Some are found as far east as the Upper Brahmaputra, where the Domes, a fishing tribe of the Sudiya district, Assam, came originally from India.

Domars, a fierce Brahui tribe [BRAHUI] in the Zarghan hills on the Baluch-Afghân frontier, where they had long been the terror of the surrounding populations before the British occupation of the Pishîn Valley. They lived solely by rapine, extending their plundering expeditions as far as the Helmand and Arghandab rivers. They are scattered in small groups over the slopes of the hills, whence they descend in winter to the Shâl Valley, near Quettah, where they pitch their skin tents. The Domars grow a little corn and vegetables, but at present live chiefly on the produce of their flocks. Although nominal Mussulmans they still practise some primitive rites totally opposed to the teachings of the Koran. They are physically a fine race, rapidly increasing in numbers and wealth since the establishment of orderly government in Baluchistân (Bellew, *Indus to Tigris*).

Dombrowski, Jan Henryk (1755–1818), a Polish general who did great service in the wars of Napoleon. He supported Kosciusko's rising in 1794, and when the Russians took Warsaw Dombrowski was treated with distinction by Suwarrow, who gave him free passage into Germany. In 1796 he entered the French service, and fought well at the head of the Polish legion in the Italian campaigns 1796–1801. He took part in the Russian campaign of 1812, and in 1813 distinguished himself at Leipzig. After the fall of Napoleon he went to Poland, and Alexander I. of Russia made him a Polish senator. He wrote a *History of the Polish Legion in Italy* (2 vols.).

Domenichino (Domenico Zampieri) (1581–1641), a painter, the last representative of the great Italian school. He was of the Lombard school and born at Bologna. He studied first under the Flemish Denis Calvaert, and then under Annibal Caracci, after which he went to Rome and was appointed painter to Gregory XV. He was much persecuted by rivals, who are said to have eventually poisoned him. In his early days his fellow-students called him "The Ox" on account of his steady plodding. He was a good colourist, and his faces are in keeping with the characters they represent, but his drapery is heavy and ungraceful. Among his chief works are *Communion of St. Jerome*, *History of Apollo*, *Martyrdom of St. Agnes*, *Triumph of David*, and *Adonis Killed by the Boar*. He had also much merit as a sculptor and modeller.

Domesday Book, the name of the record (strictly speaking, of part only, *see* below) of the great survey of England for purposes of taxation undertaken by William the Conqueror with the consent of the Witan in 1084. Commissioners, who were men of high rank, were sent out to inquire as to every estate, who had held it in the reign of Edward the Confessor; who held it at the time of the inquiry; its value at both dates, whether that value could be raised, and the title by which it was held. Careful inquiry was to be made as to the possibility of imposing increased taxation. Similar surveys had been made before in connection with the Danegeld, with which this was also ostensibly connected, but the minuteness of the investigation made the Domesday survey very unpopular. The evidence was taken in the Hundred Court. The assessment is either by the hide or the carucate (q.v.), and the record contains little direct reference to the Conquest, though indirectly there is evidence of much confiscation. The inquiry was finished in the summer of 1086. The evidence was taken on oath in the Hundred Courts. The name (Day of Judgment) said in mediæval times to have been given from the strictness of the inquiry more probably refers to the decisions of the Commissioners on closing their Courts. The survey covers all England, except the four northern counties and part of Lancashire. The results are preserved in (1) The *Exchequer Domesday* or Liber de Wintonia, properly called Domesday Book, of which vol. i. gives concisely the survey of thirty counties, and vol. ii. longer reports of Essex, Norfolk, and Suffolk. (2) The *Exon Domesday*, in the care of the chapter of Exeter cathedral, which contains detailed accounts of Wilts, Dorset, Devon, and Cornwall. (3) The *Inquisitio Eliensis*, treating of the possessions of the great Abbey of Ely. Mr. Freeman thought that vol. i. of the *Liber de Wintonia* was an abridgement of the record given in more detail in the other volumes mentioned; but this is disputed as regards the *Exon Domesday* at any rate. Domesday Book was reprinted by the Record Commission 1783–1810, and in facsimile in 1864–65.

Domestic Economy. Economy (*oikonomia*) in Greek originally meant "the management of the resources of a household." "Political Economy" being used to denote the management of those of a state, the original term obtained a distinctive if redundant prefix. As used in English elementary education, in which it is a recognised "specific subject" for girls, it includes the preparation, nutritive value and functions of food, with some elementary knowledge of cooking, sanitary rules as to cleansing and ventilation of dwellings and sick rooms, and elementary rules of health. (*See* Annual Report of the Committee of Council on Education.)

Domicile, the lawful home of anyone, or the place which the law infers as such from attendant circumstances, as the keeping of a wife or family. In the case of infants and married women their domicile is that of their parents or husband. The domicile of a person is often an important factor in legal and matrimonial and other proceedings, as it determines all his personal capacities and incapacities. Thus the question whether one can contract a legal marriage with another is regulated not by the law of the country wherein the ceremony may have taken place but by the law of his domicile; so, the legitimacy and majority of an infant (excepting his capacity of inheriting real estate) is dependent on the law of the parents' domicile, and the devolution of personal estate is regulated not by the law of the country where he may happen to die, nor by the locale of the property, but by the law of domicile. Formerly a will of personal estate was required to be made according to the formalities prescribed by the law of the country where the testator was domiciled at the time of death, but this was abolished as regards all wills made after August, 1861, and it is now sufficient if a will made out of the United Kingdom by a British subject is made according to the formalities prescribed by the law of the place where it was made, or by the law of his domicile at the time, or by the law of his domicile of origin or birth. As regards bankruptcy, a debtor must be domiciled in England or (within a year from the date of petition) must have had his residence or place of business in England. A domicile may be either original or acquired. The original domicile is that of the parents of the person at the time of his birth, and usually agrees with his nationality. The acquisition of a new domicile is only complete when the former domicile is completely abandoned, and an actual removal is made to the acquired domicile.

Dominant, in *Music*, the fifth tone of the scale.

Dominica is one of the largest of the Leeward group of the West Indian Islands, lying to the south in lat. 15° 20′ to 15° 45′ N., and long. 61° 13′ to 61° 30′ W., halfway between Martinique and Guadaloupe. It has an area of 291 square miles, and a population of about 29,500, chiefly negro, with a few whites, and some Carib Indians who occupy a reservation, but are being gradually absorbed by the negroes. The Caribs are a quiet folk, living chiefly upon fish, fruit, and vegetables. About half of the island consists of wooded mountains intersected by deep glens, rising to an extreme height of 6,234 feet, while a narrow strip along the coast is cultivated and produces sugar, cocoa, and fruit. Some timber is exported, and the fisheries are extensive. The interior parts of the island are still unexplored. The climate is agreeable, cool and even chilly in the mountains but sultry on the coast, where there is an average temperature of 89° Fahrenheit. There is much rain, the yearly fall amounting to 83 inches. Hot sulphur springs, a boiling lake in the south of the island, the scene of an eruption of ashes in 1880, testify to the volcanic origin of Dominica. Roseau, a port on the west coast, is the capital. The island is represented upon the Legislative Council of the Leeward Isles Colony, and has also a president, treasury, and a local legislature of its own. Religious equality prevails, and the majority of the people are Roman Catholics. Dominica was discovered in 1493 by Columbus during his second voyage, on Sunday, whence its name. In 1648 the treaty of Aix-la-Chapelle neutralised the isle, which had been contended for by France and England; in 1759 the English captured it, but the French held it again for a short time, till it came finally into English possession in 1814.

Dominical Letter, in the Church Calendar, the letter which marks the Sunday (Lat. *dies dominica*, Lord's day) in any given year. In the calendar of pagan Rome the first eight letters of the alphabet were used to mark successive days, the eighth (or in Roman reckoning, which includes both the terminal members in reckoning from the first of a series, the ninth) being the "nundinæ," or market-day and day of public business. The Christian Church adopted this notation for the week, reducing the letters used, of course, to seven. As, however, the only use of the letters is to indicate when Sunday will come they have obtained their present name. If the Sunday letter be A, Sunday is January 1; if D, January 4; and so on. Hence, of course, the other Sundays can be found. In leap years there are two Sunday letters, one up to February 29, the next behind in order after that date. The method of finding them is stated in the opening of the Prayer Book. Given the Dominical Letter and certain other data (*e.g.* the Golden Number) also dealt with there, the chief Church festivals for any given year may easily be discovered. The object of these letters and other data is, in fact, to obviate the necessity of an almanack.

Dominican Republic, called also San Domingo, consists of the eastern part of Haiti, embracing two-thirds of the island, and having an area of 20,587 square miles. The state is administered by a president elected by universal suffrage every four years, assisted by a Congress of 22 members. The Republic was originated in 1843, and then reverted to Spanish authority till 1865, when a revolt re-established the Republic, which, with frequent revolutions, has gone on till now. Owing to the unsettled state of things civilisation is backward, but American influence has tended to develop its resources. In the south and west sugar is cultivated, as are tobacco, coffee, and cocoa, while there are exports of mahogany, dyewood, and guano. The country also produces gold, quicksilver, iron, and coal, and there is a railway of 72 miles. The chief commerce is with the United States, England, France, and Germany. Education is free and obligatory. Spanish is the prevailing language. The capital is San Domingo.

Dominicans (*Fratres Prædicatores*, or Preaching Brethren), an order of monks established by St. Dominic, and confirmed by the Pope in 1216. From their original black dress they were known in England as the Black Friars. In 1276 the Corporation of London granted the Dominicans two streets near the Thames in the district still bearing their name. Their vows enjoin absolute poverty.

Dominis, Marco Antonio de (1566–1624), a somewhat noted ecclesiastical trimmer, was born in the Island of Arbe in Dalmatia. He was educated by the Jesuits, and became a professor of mathematics at Padua, where he wrote a work upon light and drew attention to the decomposition of the rays in the rainbow. He afterwards became Bishop of Segni, and then Archbishop of Spalato, but when a quarrel arose between the Pope and Venice he resigned his office. In 1616 he came to England, where he was well received by James I., who made him Dean of Windsor and Master of the Savoy. The next year he wrote a treatise, *De Republicâ Ecclesiasticâ*, in which he urged that the Pope was not supreme, but only *primus inter pares*. In 1619 he wrote a *History of the Council of Trent*, and in 1620, when his fellow-countryman Gregory XV. became Pope, he expressed a wish to be reconciled to the Holy See. In 1622 he desired to leave England, much to the disgust of the king, who tried to dissuade him and maintain his conversion. Failing in this, the king ordered him to leave in twenty days. At Brussels De Dominis wrote his *Consilium Reditus*, in which he recanted his errors, and then went on to Rome, where the Inquisition unkindly doubted his sincerity and put him in prison, where he died.

Domino, a garment worn by priests in cold weather over the other vestments. The name is now applied to a masquerade dress.

Domitianus, Titus Flavius (81–96), a Roman Emperor, son of Vespasian, and younger brother of Titus, whom he succeeded. In the early part of his reign he showed much promise and passed good laws, but afterwards he became jealous and cruel.

To curry favour with army and populace he increased the pay of the former, and greatly encouraged gladiatorial games in which he himself took part. He killed and banished wholesale the higher citizens, but was at last stabbed by conspirators after he had condemned his wife Domitia to death.

Don, a courtesy prefix used in Spain, equivalent to the English Esq. (It must be used with the surname only.) In England the name is given, in University slang, to the college authorities.

Don, the ancient Tanais, a river of Russia rising in a small lake in the government of Tula, and flowing south through this and other governments and the district of the Don Cossacks, and falling by several mouths into the Azov after a course of 1,125 miles. A canal unites the upper course with the Volga, and a further union between the two rivers in the lower course is proposed. There are several tributaries, some of them navigable, and the Don is navigable below the junction of the Voronej. The stream is impeded by sand-banks, and the spring floods inundate a good deal of country, rendering it necessary to build many of the neighbouring dwellings upon piles. There is good fishing in the river. Two British rivers—in Yorkshire and Aberdeenshire respectively—bear the same name.

Dona Francisca, a German colony of Brazil, lying between the Sierra do Mar and the coast in the province of Santa Catharina. It is fourteen miles inland from San Francisco, and has an area of 979 square miles. The capital is Joinville.

Donaldson, John William, D.D. (1811–1861), an English scholar, was the son of a London merchant. Articled in early life to a solicitor, he went to Trinity College, Cambridge, in 1831, graduating in 1834 as 2nd classic and senior optime. He became Fellow and Tutor of his College, and from 1841–55 he was headmaster of Bury St. Edmund's grammar school. He returned to Cambridge, where he gave tuition till his death. His chief works are *New Cratylus* (1839), *Varronianus* (1844), *The Theatre of the Greeks*, and his Greek and Latin grammars. He attempted a work of theological criticism. *The Book of Jasher*, which brought him into some odium.

Donatello (1386–1465), the nickname of Donatodi Betta Bardi, a noted Italian sculptor, born at Florence, where he was apprenticed to a goldsmith. At fifteen he went to Rome with his friend Bruneleschi, and there they studied, supporting themselves meantime by the exercise of their goldsmith's craft. Donatello had already before leaving Florence carved a wooden crucifix, a St. Mary Magdalen, and a marble St. John, after his return from Rome he carved some marble prophets and an Annunciation. Between 1408–1416 he carved in marble SS. Peter, Mark, and George for the outside of the church of St. Michael. In 1426 he executed a tomb of Pope John XXIII., in 1427 one for Cardinal Brancacci at Naples, and in 1429 one for Bartolommeo Aragazzi. Other noted works are a bronze statue of David, and a large equestrian statue at Padua. His last works—two bronze pulpits—were finished by others after his death. He combined much of the spirit of ancient sculpture with an originality of his own, and inaugurated a new era in the art.

Donati, Giambattista (1826–1873), an Italian astronomer, was born at Pisa. In 1852 he became an assistant in the observatory at Florence, becoming director of it in 1864. In 1858 he discovered the bright comet of 1858 which bears his name. Few who saw that comet will forget its magnificence. Besides having a great share in the building of a fine observatory near Florence, Donati constructed a spectroscope of twenty-five prisms.

Donatists, the name given to a sect of Early Christians in Africa, who refused to acknowledge Cæcilianus as bishop of Carthage because he had been appointed by Felix of Aptunge, whom they called a traditor (q.v.). Donatus (sometimes called "the Great"), who gave his name to the sect, succeeded Majorinus, who was the candidate selected in opposition to Cæcilianus. Constantine declared in favour of Cæcilianus, but the Donatists grew in numbers and power until they began to disagree among themselves and split up into various branches. They were annihilated by the Vandals in the 7th century.

Donatus, Ælius (4th century), a grammarian and rhetorician of Rome, who was the teacher of St. Jerome. He wrote several treatises upon the several parts of grammar, and these were so widely used that "Donat" became a word synonymous with grammar, and is so employed in a French proverb, and in the title of a book written by an English bishop. For his works as issued in the early days of printing letters cut on wooden blocks were first used. Donatus also wrote a commentary upon Terence.

Donauwörth, a town of Bavaria, at the junction of the Wörnitz with the Danube, twenty-five miles north-west of Augsburg. It was once a free Imperial city, but its importance has become almost insignificant. The town is of some historic note, for in 1607 it fell under the ban of the Empire and was punished for insulting the Host; it was twice stormed in the Thirty Years' war; in 1704 Marlborough took a French and Bavarian camp formed near by; and in 1805 Soult there defeated an Austrian army.

Don Benito, a town of Spain, near the left bank of the Guadiana, 69 miles east of Badajoz. The town is in a good fruit and grain country.

Doncaster, a municipal borough and market town of the West Riding of Yorkshire, is on the right bank of the Don, 33 miles south of York. It is a well-built town, with a High Street one mile long, with some fine public buildings, including a guildhall, a corn exchange, wool and cattle markets, and a lately rebuilt parish church with a tower and spire of 170 feet. Doncaster is an important railway junction, and the Great Northern Railway Company has here extensive locomotive and carriage works. There are good waterworks. The chief manufactures are iron and brass wares, agricultural machines, sacking, and

linen. The town is noted in the racing-world, the well-known St. Leger having been instituted in 1776. The racecourse is a mile south of the town, and the road to it is bordered by fine old elms. The country round is beautiful though flat, and there is an important cattle market, and a good trade in agricultural produce. An important Roman station on the road from York to Lincoln occupied the same site, and many Roman remains have been found in the neighbourhood, including a votive altar, urns, coins, and the like. There was also here a palace of the Saxon Kings of Northumbria, and the Danes often ravaged the district. In the neighbourhood are the ruins of Conisborough Castle, of which Scott speaks in *Ivanhoe*.

Donegal. 1. An Irish county on the sea-coast in the province of Ulster, having the Atlantic Ocean on the north and west. It has a length of 84 miles with a greatest breadth of 41 miles, and its area is 1,870 square miles, while the bold and broken coast is 166 miles in extent, and is studded with islands large and small. Tory Island, at the entrance of Lough Swilly, has the remains of seven churches, two stone crosses, and a round tower, and on an island in Lough Derg is a noted pilgrim resort called St. Patrick's Purgatory. The surface is much diversified by mountains, moors, bogs, lakes, and rivers; the largest river being the Foyle with a north-east course of 16 miles into Loch Foyle, and the largest lake Loch Derg. The greatest height is 2,462 feet. The climate is moist, and at times rough, owing to the prevalence of north and north-west winds. The county produces much granite, and there are quarries of freestone and white marble. The chief industries are fishing, and the manufactures of woollens, worsted, muslin, and kelp. The trade is carried on mostly through Londonderry. Lifford is the county town. The greater proportion of the population is Roman Catholic. The county returns four members to Parliament. The mountain population is said to be descended from the old Irish clans, but the lowlands are peopled by the descendants of those planted there in 1612 by James I. The O'Donels were once princes of Tyrconnel, which comprised part of Donegal, and besides many ruins of castles, forts, and religious houses, there are near Lough Swilly the remains of a palace of the North Irish kings, and near Derry is their coronation stone. There are also memorials of St. Columba.

2. A seaport town of Ireland, in Donegal Bay, on a creek at the mouth of the Eske, in the south of county Donegal, 157 miles north-west of Dublin. The town is in an alluvial plain surrounded on three sides by hills rising into mountains. The district produces corn and butter, and a railway communicates with the city and port of Londonderry. The remains of Donegal Castle are to be seen on the river, and on the shore are the ruins of a fifteenth-century Franciscan monastery. In the neighbourhood are some mineral springs.

Dongarpur, a central Indian town of Rajputana, capital of a protected state 1,000 miles in area of the same name, 340 miles N. of Bombay.

Dongola, NEW, a town of Nubia on the left bank of the Nile, above the third cataract, 750 miles S. of Cairo. It was formerly an independent kingdom with a capital, Old Dongola, the ruins of which are 75 miles S.E., on the right bank of the Nile. It was destroyed by Mamelukes in 1820. A good trade in slaves was formerly carried on here, but the Soudanese war crippled it. In the campaign of 1884–85 New Dongola was the base of British operations against the forces of the Mahdi.

Dongolawi, properly the natives of the province of Dongola, Nubia, but in recent times the term has been applied collectively to all the inhabitants of Nubia, and especially to the Nubo-Arab officials in the employment of the Egyptian Government in Eastern Soudan down to the time of the Mahdi's revolt. The Dongolawi proper comprise two distinct elements—the Barabras, a mixed Nubian people representing the ancient Ethiopians, and the Arab immigrants chiefly from Hejaz. During the mediæval times they were the dominant people in the middle Nile Valley till that region was reduced by the Funghi (Funj) Kings of Senaar. After the overthrow of the dynasty of the Shakieh Arabs the Dongolawi again rose to power, and it was by their aid that the Mamelouk refugees from Egypt were able to drive out the Shakiehs. This event prepared the way for the conquest of Eastern Soudan by the Egyptians under Mehemet Ali in 1821.

Dongos (MATIMBOS), a dwarfish people of equatorial Africa, north-east of the Tobbi country, and north of the Setté river. Like the Abongos of the Ogoway basin they appear to be a surviving branch of the primitive pigmy element, fragments of which are still met under various names scattered over a vast area in the interior of the continent (Oscar Lenz).

Donizetti, GAETANO (1797–1848), an Italian composer born at Bergamo, where he studied as well as at Bologna. He entered the Austrian military service, and in 1818 his first opera *Enrico de Borgogna* was produced at Venice. In 1822 he produced *Zoraide di Granata*, and left the army. His *Anna Bolena* in 1830 brought him much renown, which was increased by *Lucia di Lammermoor* in 1835. In 1840 he was at Paris and wrote *Fille du Regiment*, *Lucrezia Borgia*, and *La Favorita*. His comic opera *Don Pasquale* was a success, but his later works were failures. His health gave way, he was attacked by paralysis, and returned home to linger and die. Donizetti wrote over 60 operas, and he was a rapid worker, being said to have written some of his operas in the course of a few hours. He followed first Rossini and later Bellini, and his works are marked by their melodiousness and a neglect of orchestral effects.

Don Juan, a dramatic character embodying sensuality and libertinism unchecked by conscience and followed out to the end. He has been described as a southern Faust, of the senses not of the intellect, and portrayed not in poetry but in music. His life is a drama of lawless love. He seeks to seduce the daughter of the Governor of Seville, slays the Governor, penetrates afterwards to his tomb, and gives a banquet to which he invites the stone statue

of the Governor. The statue appears and drags Don Juan away to Hell. According to another version, Don Juan sold himself to the Devil, but repented and died a monk. The story was dramatised early in the 17th century by a monk named Gabriel Tellez. Molière used it (1665) in his *Don Juan ou le Festin de Pierre*, and Shadwell (1676) in his *Libertine*. Mozart's *Don Giovanni* (1787) is also on this theme. Alexander Dumas used it for his *Don Juan de Marana*, and Prosper Merimée his *Âmes du Purgatoire ;* and Byron's *Don Juan* lays it in some degree under contribution.

Donkey Engine is the name given to a small subsidiary engine employed for various purposes, such as the feeding of boilers with water or the lifting of weights, etc.

Donne, JOHN (1573–1631), an English poet said by Ben Jonson to be "the first poet in some things of his time," and by Dryden, "the greatest wit though not the greatest poet." Ben Jonson said also that his works would not live as they would not be understood, and this has proved true. Donne was born in London, being related to Sir T. More, his mother being the daughter of John Heywood, and his father of Welsh descent. He was a Catholic in his early days, and after entering at Hart Hall, Oxford, where he became a friend of Sir Henry Wotton, he travelled, and in 1592 he entered at Lincoln's Inn and joined the Church of England. After taking part in Essex's Spanish expedition he became Secretary to the Lord Keeper, Sir T. Egerton. In 1600 he secretly married the daughter of Sir G. More and niece of Sir T. Egerton. For this he was dismissed from his post and imprisoned, but he managed to be released and to get into favour at Court. He entered Anglican orders in 1615, and was appointed Royal chaplain. In 1616 he received the livings of Keyston, Hunts, and of Sevenoaks, Kent. He was appointed reader at Lincoln's Inn, and as a preacher he is greatly extolled by Izaak Walton, who wrote a life of him. In 1621 he was made Dean of St. Paul's, and was buried in the cathedral. His first poem was printed in 1611, being an eulogy on Sir Robert Drury's daughter.

Donnybrook, now almost absorbed in Dublin, but formerly an outlying parish and village. Its fair, which lasted from the time of King John till 1855, gave rise to many fights and became proverbial.

Doo, GEORGE THOMAS (1800–1886), an English line engraver born in Surrey. He engraved for a time in London, and in 1825 went to Paris, where he studied under Suisse. In 1851 he became F.R.S., and an Academician in 1857. He has produced many well-known engravings from Correggio, Raffaelle, and others. Among the best are *Nature*, after Lawrence (1830) ; *Knox Preaching*, after Wilkie ; *Heads*, after Lawrence ; *Italian Pilgrims in Sight of Rome*, after Eastlake ; and his last unfinished work, *Raising of Lazarus*, after Sebastian del Piombo (1864). He also painted in oils, chiefly portraits.

Döppler's Principle. If waves on the sea succeed each other at equal intervals of one second we know that a stationary boat floating on the water is passed by sixty waves in a minute. If the boat advances towards the direction from which the waves are coming, more than sixty waves will pass it per minute. Thus, if it travels at the rate of the waves themselves, 120 waves will be received in that interval. So also if the boat retreats in the reverse direction, *i.e.* in the same direction as the waves are travelling, we know that fewer waves will manage to pass it per minute. In fact, not one will pass the boat if it travels at the same rate as the wave-motion itself. This principle, applicable to all cases of wave-motion, is known as Döppler's principle, and is of considerable importance. A steam-whistle on a railway-engine emits a certain note when the train is motionless. If the train be approaching the observer, more waves of sound reach his ear per second than in the first case, and the note seems of higher pitch. If the train is receding, the note is of lower pitch. Again, the light from a distant star is composed of various colours. Each of these colours corresponds to a definite number of waves striking the retina of the observer's eye per second. If the star approach the earth, each colour is slightly changed ; a slight change of a different nature takes place when the star recedes from the earth : and by noting the discrepancy that occurs in the light from flaming sodium that reaches us from a distant star, we are able to estimate the speed at which the star is changing its distance from our solar system.

Dor, MONT, properly DORE, a group of the Auvergne Mountains of France in the Department of Puy de Dôme. The highest point of the group and of Central France is the Puy de Sancy (6,190 feet). The country is of volcanic formation, and is of great renown in France and the neighbouring lands for its waters and as a health resort.

Dorachos, one of the civilised nations of Central America, who, since the Spanish conquest, have almost entirely disappeared, though a small Doracho tribe still survives about lat. 9° N. on the Pacific coast. They are the dominant people in Veraguas, south of Costa Rica, and to them are attributed the inscriptions, tombs, and other monuments scattered over the western districts of the Panama Isthmus. Of the Dorachos themselves nothing is known beyond what can be conjectured from these remains, which represent a civilisation quite distinct from that of the Northern Aztecs and Mayas.

Doran, JOHN, Ph.D. (1807–1878), an English man of letters born in London. He knew French well, and for this reason was chosen in 1823 as a tutor for the foreign travels of G. Murray, afterwards Duke of Athole. He afterwards held other travelling tutorships. He was in later years acting editor of the *Athenæum*, and afterwards editor of *Notes and Queries*. In 1824 his melodrama, *Justice ; or, the Venetian Jew*, was produced at the Surrey theatre, and in 1828 he published a *History of Reading*. Among his many other works are *Their Majesties' Servants*, a history of the stage, *A Lady of Last Century, Mann and Manners, Letters from Sir Horace Mann to Horace Walpole*, and in 1885 was produced posthumously *In and about Drury Lane*.

Dorcas, a woman mentioned in the Acts (ix. 36) as the subject of a miracle worked by St. Peter. From the direction her charity took, societies for making clothing for the poor are known as "Dorcas societies."

Dorchester. 1. A municipal borough, county, and market-town of Dorsetshire, on the Frome, 8 miles N. of Weymouth, and 120 miles from London. It has breweries of ale and beer, and is the centre of a good agricultural and cattle-producing district. The cattle-market is held on Saturday. The Elizabethan grammar school, founded 1579, has been rebuilt and re-organised under a scheme of the Charity Commissioners. There is a county museum containing some good geological specimens, and a fine piece of Roman pavement. Dorchester is the head of the 39th Regimental District, and has a Royal Horse Artillery barracks. There was here a Roman station consisting of walled town with ditch, and there are the remains of a Roman amphitheatre, 218 feet by 163 feet in area and 30 feet deep, with seats cut in the chalk, capable of holding 30,000 people. There is also a Roman camp with ditch and rampart, and also a large British station with three earthen ramparts. The town was Cromwell's headquarters in 1645, and in 1685 the Bloody Assizes made 292 victims.

2. A village near Oxford noted for its fine church, and as having been the seat of the Bishops of Mercia, and for a curious ridge of gravel which is, or was, to be seen in a field there, as to whose origin several theories have been formed.

Dordogne, a department in S.W. France, has an area of 3,530 square miles, and takes its name from the river which, after a course of 305 miles (185 of which are navigable), unites with the Garonne to form the Gironde. The climate is for the most part mild and healthy, but the soil is poor and hilly, with much forest and underwood, alternated in places by lovely valleys and vine-clad hills. There is little agriculture, but some iron working, and manufactures of paper, woollens, and glass. Wine and brandy, oil, fruit, and fat cattle are produced. The truffles of Périgord are famous. Capital, Perigueux.

Doré, GUSTAVE (1833–1883), a French engraver and painter, born at Strasburg. He came to Paris when twelve years old, and when fifteen was exhibiting pen and ink landscapes in the Salon. In 1848 he was engaged on illustrated journals, and in 1854 produced his first continuous work—a set of illustrations to Rabelais. In 1856 appeared his illustrations to *The Wandering Jew* and to the *Contes Drolatiques* of Balzac. In each of these he showed his great powers in producing effects weird, horrible, and grotesque. Who can forget the scene of the Jew taking off his boots at the Last Day, or the view of a besieged castle in the *Contes Drolatiques*, where everyone has his spear or sword in somebody else, and the eye by going from weapon to weapon is led throughout the picture? His *Inferno* in 1861 exhibits the same power of depicting horrible scenes. Then followed the *Contes* of Perrault, *Don Quixote*, *Purgatorio*, *Paradiso*, *Paradise Lost*, the *Idylls of the King*, La Fontaine's *Fables*; but his later works show a great falling-off, the natural result of over-production. Doré was also a painter, but in this department of art he did not excel, though his work is not without its admirers. *Christ Leaving the Prætorium*, and the *Entry into Jerusalem* are well known, and the Doré Gallery in London was well visited. He also made some attempts in sculpture.

Doria, ANDREA (1466–1560), a Genoese admiral, born of a noble family that had fallen into decay. Andrea was born at Oneglia, and at the age of nineteen entered the Pope's body-guard. On the accession of Alexander VI. he took service with the Duke of Urbino, and then with Alfonso of Naples, and then went to the Holy Land till the Borgia tyranny should be overpast. He then joined the Prince of Sinigaglia against the Spaniards, who were overrunning Italy. In 1503 he retired to Genoa and commanded the galleys of the republic against the Turkish corsairs, and greatly distinguished himself. In 1522 a revolution in the imperial interest to which he was opposed drove him forth, and he offered his services to the King of France, gaining many victories over the forces of the Emperor. In 1529, for some unknown reason, he quitted Francis I. and offered himself to Charles V., who received him gladly, and in his service Doria inflicted many defeats upon his old comrades the French. He was welcomed at Genoa, where he became head of the State and established a form of government of aristocratic tendencies. The Emperor bestowed upon him the Order of the Golden Fleece, and made him Prince of Melfi. The war against the Corsairs almost became a duel between Doria and Barbarossa, the Turkish leader. In 1531 Doria made an attack upon Barbarossa's stronghold on the Barbary coast, but did not accomplish much, though the next year he took Patras and Coron from the Turks. In 1535 he went with Charles V. to Tunis and destroyed Barbarossa's fleet. The latter, as commanding-in-chief the Turkish navy, then harassed the Mediterranean islands, and in 1538 offered battle to the Imperial, Papal, and Venetian fleet, and overcame Doria, who was again worsted by him in 1541, and by his pupil in 1560. Though beloved by the people and a favourite councillor of Charles V. and his son Philip, Doria incurred some odium in his later years for the savage vengeance he took upon the slayers of his nephew. He died at Genoa without issue.

Dorians, one of the four great divisions of the ancient Greeks (the other three being the Achæans, the Æolians, and the Ionians). They obtained their name from the district of Doris in the centre of Hellas, near Aetolia and Thessalia, and supposed by some to have been their original home. They were noted for their simple, rough, earnest manners and characteristics, as opposed to the more effeminate, polished grace of the Ionians. But these manners chiefly marked those of Sparta and Crete: the Dorians *e.g.* of the Colonies are much more like the Ionians in character.

Doris, one of the best known genera of Nudibranchiate (q.v.) Gastropoda or "Sea-slugs." It is

the type of the family *Doridæ*, or the "Sea-lemons." They are always shell-less, and are depressed, flat animals, with a pair of tentacles standing up in front and a clump of gills behind. They creep about over seaweeds and rocks; they occur in all seas from the tropics to the frigid zones; they all live near the shore and rarely occur at a depth of more than twenty-five fathoms.

Dorislaus, Isaak (1595–1649), was born at Alkmaar, in Holland, and in 1627 came to England, where he lectured upon History at Cambridge, and was appointed Judge-Advocate. In the Civil struggle he sided with the Parliamentarians, and in 1649 went to Holland to negotiate an alliance with the States-General, and here he was stabbed by some Royalist conspirators. His body was buried in Westminster Abbey, whence it was removed to St. Margaret's church in 1661.

Dorking, a charmingly-placed town of Surrey at the foot of Box Hill, 24 miles S.W. of London. In the neighbourhood is the estate of Deepdene, where "Anastasius" Hope lived and Disraeli wrote *Coningsby*, and a pretty walk through the estate leads to Leith Hill (960 feet), which commands a view of the Weald and a glimpse of the sea through a gap in the South Downs. There is also a pleasant walk along a ridge of the Downs to Guildford. Many visitors look for the "Markis of Granby" of Pickwickian renown, but in vain, since Dickens apparently adopts the sign in a Pickwickian sense.

Dormer Window, a window in a sloping roof built with a vertical roof of its own.

Dormouse, a name for any of the Myoxidæ, a family of arboreal nocturnal mouse-like Rodents (q.v.), from the Palæarctic and Ethiopian regions, and distinguished from the rest of the order by the absence of a cæcum. The Common Dormouse (*Myoxus avellanarius*), the only British species, but widely distributed in Europe, is about six inches long, of which the rather bushy tail is a little less than a half. It feeds on nuts, acorns, seeds, berries, and the buds of shrubs and trees. In autumn it builds a nest, and, like the rest of the family, undergoes a partial hibernation. The Loir (*M. glis*), a larger species, is confined to the south of Europe, and ranges into Asia. The Romans fattened it for food, and it is still eaten in Italy. The Garden Dormouse, or Lerot (*M. nitela*) is common in Southern and Western Europe. Some authorities have made the African species, in which the tail ends in a pencil of hair, a separate genus, and have split up Myoxus into sub-genera, but the differences are not important and the family is generally considered to have but a single genus.

Dorner, Isaak August (1809–1884), a German theologian, born near Tuttlingen, in Würtemberg. After studying philosophy and theology at Tübingen he travelled in England and Holland and filled various chairs till called to Berlin in 1851. He had great influence, and his writings had much to do with forming modern German theology.

Dorpat, a Russian town in Livonia on the Embach, 165 miles S.W. of St. Petersburg. The town possesses two suburbs, and the river is crossed by a good granite bridge. The Domberg Hill, on the right bank of the river, had a citadel, bishop's palace, and cathedral, but is now occupied by an observatory and a library surrounded by gardens and walks. There are fine botanic gardens. The city is the centre of the Germanising influence, and its population is mostly German. Among the industries are printing, brewing, the making of cigars, tiles, pianos, and there is a trade in wood, corn, and flax. The University, founded in 1632 by Gustavus Adolphus, and refounded in 1802 by Alexander I., is entirely Russian in its influence.

D'Orsay, Alfred Guillaume Gabriel (1801–1852), was a shining light of fashionable society of his day, and the Admirable Crichton of the early part of the century. The son of General D'Orsay, he was a lieutenant in the Garde du Corps of Louis XVIII., and in this capacity made the acquaintance of Lord and Lady Blessington. He much appreciated the lady's society, and accompanied the pair to Italy and elsewhere till 1827, when he married the Lady Harriet Gardiner, stepdaughter of Lady Blessington, the lady being 15 years old. In 1829 Lord Blessington died, and D'Orsay quitted his wife to live with Lady Blessington in London, where for 20 years the pair retained great social influence. D'Orsay was a friend of Louis Napoleon, and just before his death was appointed by the latter Director of Fine Arts in Paris.

Dorsetshire, a southern English county on the coast of the English Channel, between Hampshire on the E. and Devonshire on the W., with an average breadth of 21 miles and a length of 58 miles, and an area of 627,265 acres. About half is arable, and the greater part of the rest is pasture-land. There are 75 miles of coast, with fine cliffs and headlands, the highest points being Golden Cap (619 feet) and St. Alban's Head (354 feet). Chalk downs stretch along the south coast, and through the middle of the county from E. to W., rising to a greatest height of 934 feet. The principal rivers are the Stour and the Frome. The geological formation of the county is chalk, clay, oolite, lias, weald, and greensand, and some fine fossils of extinct reptiles have been discovered. Purbeck marble, Portland building stone, china clay, and pipeclay are found. The climate is mild, and the upper soil of sand, gravel, clay, and chalk is specially fitted for cattle-breeding and dairy purposes. The short, sweet grass of the Downs supports an excellent breed of sheep, and Dorsetshire cheese, butter, and cattle are renowned. One of the most striking features of the county is the Chesil Bank, a ridge of pebbles 10 miles long uniting the so-called Portland island with the mainland, and enclosing a narrow tidal channel containing decoy ponds, and a noble swannery at Abbotsbury, south of Portland. The meeting of the tides causes a dangerous current called the Race. Portland is a well-known convict station, harbour of refuge, and coaling station; it is well fortified, and the harbour is protected by a breakwater. There are in the county manufactures of linen, silk, woollens, and other goods, and ale and cider are brewed. The county

returns four members to Parliament. The London and South Western, the Great Western, and the Midland railways serve the county. There are many British and Roman remains, among the former being a long-chambered barrow with intricate passages. Of later ruins perhaps the most interesting is Corfe Castle. A naval battle between Alfred and the Danes was fought off the coast in 876.

Dorsibranchiata, a synonym of Errantia (q.v.), a name for that group of worms in which the gills are borne as a series of tufts along the back.

Dorstenia, a genus including thirty-six species of curious herbaceous plants, natives of tropical America, related to the figs. They have radical leaves and a scape terminating in a common receptacle, which is often quadrangular and on which are the numerous achlamydeous flowers. The ovary is one-chambered and one-seeded, and has a bifid stigma. After the fertilisation of the flowers the receptacle becomes slightly succulent, though less so than that of the figs. It thus resembles a fig opened out into a plate-like body.

Dort, or DORDRECHT, a town of South Holland, 10 miles S. of Rotterdam, upon an island in the Maas, which was formed by the famous inundation of 1421, which swallowed up 70 villages and 100,000 people. It is one of the oldest and once richest trading towns of the Netherlands, and was founded in 1013. Its Gothic cathedral and its town-hall date from the 14th century. It is intersected by canals, and its harbour admits large East Indiamen and the huge wood-rafts of the Rhine. There are ship-yards, corn and saw-mills, and there are industries in oil, sugar, ironware, and machinery. In 1572 the first assembly of the States took place here, and in 1618 the Synod of Dort approved the doctrines of Calvinism. The De Witts, Ary Scheffer, and Cuyp were born here, the last of whom constantly introduces the features of Dort into his paintings.

Dortmund, the chief town of Westphalia, near the Ernscher, 72 miles N.E. of Cologne. It was formerly a free Hanse town, and was ceded to Prussia in 1815. The prosperity of the town has been much increased by the neighbourhood of coal-mines, and it is the head of the mining district and the centre of a railway system. Among its industries are iron and steel and machinery works, and very many breweries. The town has an interesting early history, and there are several old churches. An old linden marks the site of the Vehmgericht. The demolition of the walls in 1863 has much modernised the town.

Dory, any fish of the Acanthopterygian family Cyttidæ, with two genera (Zeus and Cyttus), from the seas of the temperate zones. The body is elevated and compressed, with minute scales or naked, and in the first-named genus there are bony plates at the base of the dorsal and anal fins and along the abdomen. Zeus has six species, all excellent food-fish. The best known is *Z. faber*, the John Dory, from the Mediterranean and the coasts of Western Europe, and occasionally found on the British coast. It is usually of a metallic yellow, or brownish olive, with a black spot on each side, said to be the marks left by St. Peter's fingers when he took the tribute-money from its mouth. The membrane between the spines of the first part of the dorsal fin is produced into long filaments. It is very voracious, and a specimen 22 inches long is recorded by Couch.

Doseh, a religious ceremony formerly practised in Egypt by the Dervishes. The participators in the spectacle lay down on their faces side by side, and the sheikh then rode over the bodies. The late Khedive Tewfik abolished the ceremony.

Dostoieffsky, FEODOR MIKHAILOVITCH (1818–1881), a Russian author, born at Moscow. He at first entered the army, but abandoned it for literature. He wrote a work, *Poor People*, in 1846, but being concerned in plots in 1849, he was condemned to the mines of Siberia for twelve years. He was allowed to return to St. Petersburg in 1856, and in 1861 he wrote an account of prison life. In 1868 he published *Crime and Punishment*, which was well received, and has been translated, but other works of his have not made much mark.

Dotterel (*Eudromias morinellus*). a bird of the Plover family visiting England, chiefly the eastern counties, in the summer, sometimes breeding in the northern parts of Britain. Its length is about $9\frac{1}{2}$ inches; the summer plumage brownish-grey above, ferruginous beneath, with some white on the head and breast, and a black patch on the belly. In winter the colour is mostly blackish-ash, with a white patch on the breast. These birds, which are prized for the table, have an undeserved reputation for stupidity. The Ring Dotterel (*Ægialitis hiaticula*), common on the British coasts all the year round, is said to act as sentinel to some of its allies.

Douay (the Roman *Duacum*) is in the department of the Nord, on the river Scarpe, 20 miles S. of Lille, and is one of the chief military towns of France, strongly fortified, and possessing arsenal, cannon foundry, and school of artillery. It has good churches, hôtel de ville, library, museum, hospital, and artillery barracks. The chief industries are the manufacture of lace, cotton, oil, soap, ironware, and machinery. But the chief interest to Englishmen of Douay is centred in the fact that it was the centre of English Catholicism after the Reformation. Cardinal Allen founded an English college here in 1568, and it was from here that most of the missionary priests were sent to England. The college sent a colony to Rheims in 1578–93. The Douay Bible was printed at both places—the New Testament at Rheims in 1582, and the Old Testament at Douay in 1610. Many other important works were printed here. The college buildings are now the artillery barracks. Among the Douay students expelled from France during the First Revolution was Lingard the historian. Ushaw College, near Durham, is an offshoot of Douay. There were also Scottish, Irish, Franciscan, and Benedictine colleges. In early times possession of Douay was disputed between French and Flemish. Passing

later to Spain, it was taken by Louis XIV. in 1667. Marlborough took it in 1710, but it was reoccupied by France, and secured to her by the treaty of Utrecht.

Double, the apparitional soul of an absent person, a wraith. Sometimes its appearance is a case of bilocation (q.v.), at others it is said to portend the death of the person seen. To see one's own double is thought by some to be a sure sign of approaching death.

Double Flowers differ considerably in structural origin. Most commonly they consist in an increased number of petals with entire loss of stamens and carpels, as in roses, bachelors' buttons, ranunculi, etc. Sometimes the carpels only or the stamens only are petaloid, or there may be, as in double stocks, an increased number of petals by chorisis (q.v.) without any change of stamens or carpels. Among gamopetalous flowers there may be a petaloid calyx, as is sometimes the case in Primula; or there may be a second corolla or "cata-corolla," as an outgrowth outside the normal one, as often occurs in Campanula; or both calyx and corolla may be repeated once or oftener one inside the other, "hose in hose." The term double flower is less accurately applied to the inflorescences of certain Compositæ in which either all the tubular disc florets become ligulate like those of the ray, as in the Dahlia; or, as in "quilled" chrysanthemums, their tubes are elongated; or, as in the "dragon" varieties, they are irregularly prolonged in distinct petalline segments. The so-called double Poinsettia (q.v.) has merely some extra coloured bracts below the inconspicuous inflorescences. Though double flowers do occur in a wild state they are far more common among cultivated plants, being produced by some check to vegetation, either by starvation; by plethora, *i.e.* an excess of food which the plant cannot assimilate; or by sterility, the removal or non-development of the sexual organs. Double stocks are raised from plants weakened by starvation—*i.e.* drought, which produce short pods with few seeds, only the seeds from the lower part of the pods being sown. The tendency to form double flowers becomes hereditary.

Doubling the Cube, an ancient mathematical problem discussed by Greek geometricians. It practically means finding an expression for the length of the side of a cube that shall have twice the volume of another cube whose side is given. The solution of the problem cannot be obtained by use of straight lines and circles only, but may be effected by use of the conic sections or other special curves.

Doubs, a department of eastern France upon the Swiss and Alsatian frontiers, with an area of 2,010 square miles. The chief rivers are the Doubs (270 miles) and the Ognon (120 miles), both tributaries of the Saône. The country is hilly, and in the S.E. the Jura Mountains rise to a height of 4,600 feet. The climate is rigorous and moist, and though agriculture is backward, it is advancing, lands being drained and reclaimed, and three-quarters being now under cultivation, or planted with timber. The chief products are wheat, oats, vine, and figs. There is much pasturage and making of butter and cheese, and rearing of horses and goats. There are iron mines and manufactures of iron-ware, clocks, glass, paper, and pottery. The capital is Besançon.

Douce, Francis (1757–1834), an English antiquary, born in London. He was keeper of the MSS. in the British Museum. His books, MSS., prints, and coins he left to the Bodleian Library, his letters and commonplace books to the British Museum, in a box not to be opened till 1900. Among his works are *Illustrations of Shakespeare* and *The Dance of Death;* he contributed to antiquarian and other magazines, and aided in editing several works.

Douglas, a town on the east coast of the Isle of Man, and the capital of the island, derives its name from Dhoo (black) and Glas (grey), the names of two small rivers that fall into the sea there. It is a pretty town, lying in a beautiful bay. The approach to Douglas upon a fine summer's day, when the green amphitheatre of the hills opens to view behind the blue waters of the bay, is said to be equalled only by that of Naples. The charms of the island, added to its nearness to the English coast—75 miles from Liverpool, 46 from Barrow—and its bathing facilities, have made it one of the favourite holiday resorts. There is a landing stage, together with a new pier and breakwater, and a new street and promenade have been lately constructed. The new Douglas of hotels and lodging houses has almost swallowed up the little old town. Castle Mona—once the abode of the Dukes of Athole, lords of Man—is now an imposing hotel, strikingly situated upon the cliff and surrounded by fine grounds. A striking feature in the bay is the Tower of Refuge, built upon a dangerous rock in the bay by Sir William Hillary, founder of the National Lifeboat Institution, and intended to be a refuge for shipwrecked sailors. There is a daily service of steamers to Douglas in the summer, and there are many pleasant excursions to be made in the neighbourhood—to Laxey, with its huge water-wheel, across the island to Peel, to Kirk Braddan churchyard, with its old Runic tombstones and the monuments of the Dukes of Athole, to the ruins of St. Bridget's convent; while a bay a little to the north abounds in beautiful sea anemones.

Douglas, the name of one of the most ancient Scottish families, whose border life gave them experience in war and made them formidable. Some of the most noted are William, the companion of Wallace, "good" Sir James who fought at Bannockburn and carried the heart of Bruce to the East, and Archibald, Regent of Scotland, killed at Halidon Hill, William the 1st Earl, who fought at Poitiers. James the 2nd Earl, killed at Otterburn, 1388. The later Douglases were a younger branch of Angus, and were called Red Douglases by way of distinction from the older branch of Black Douglases. Lord Darnley's mother was the great granddaughter of Archibald Bell-the-Cat. The Dukedom of Douglas, founded in 1703, became extinct in 1761. The line of Angus is now represented by the houses of Hamilton and Home.

Douglas, DAVID (1798–1834), a Scottish botanist. While working in the Botanical Gardens at Glasgow he attracted notice, and in 1823 became collector to the Horticultural Society of London. He went to the United States, explored the Columbia river and California, travelled from Vancouver to Hudson's Bay making collections, and gave his name to the *Abies Douglasii*. Finally he lost his life in the Sandwich Isles by falling accidentally into a wild-beast trap and being killed by an animal already entrapped.

Douglas, GAWIN (1474–1522), son of Earl Archibald of Angus (Bell-the-Cat), was a Scottish poet, born at Brechin. He was educated at home and at Paris and took orders, but did not meet with the preference that his prominent position might have led him to look for. He was active at politics and was present at Flodden, where his two brothers and 200 of the Douglases fell. It was at this period that he wrote most of his poems. Later he was made Bishop of Dunkeld, but the intrigues of the Hamiltons against the Douglases turning in favour of the former, he was forced into exile, and finally died in London of the plague. Among his poems are *The Palace of Honour*, an allegory of the virtuous man, and *King Hart*, an allegory of the human heart, not published till 1788. He is also famous for having translated the *Æneid*, with prologues to the different books, the first poetical translation of classics into English.

Douglas, SIR HOWARD, Bart., K.C.B. (1776–1861), the son of Admiral Sir Charles Douglas, was an English general and writer upon military subjects. He served in the Peninsular war, and was Governor of New Brunswick (1823–29) and Lord High Commissioner of the Ionian Islands (1835–40). He became general in 1851. Among his works are an *Essay on Military Bridges* (1816), a treatise on *Naval Gunnery* (1819), *Observations on Carnot's System of Fortification*, a treatise on *The Value of the British Provinces in North America*, and a work on *Naval Evolutions* (1832).

Douglas, JOHN (1721–1807), Bishop of Salisbury, was the son of a shopkeeper in Fifeshire. Educated at Dunbar and Oxford, he took orders, and was a military chaplain in Flanders, being present in 1745 at the battle of Fontenoy. He was made bishop in 1791. Most of his writings were of a controversial nature, among them being a *Defence of Milton against the Charge of Plagiarism* (1750) and *Letters on the Criterion of Miracles*, against Hume (1754). He also edited Captain Cook's journals. He was a member of the Royal Society, and Vice-President of the Society of Antiquaries.

Douglas, STEPHEN ARNOLD (1813–1861), an American statesman born at Vermont. He became attorney-general of the state of Illinois, and in 1843 was elected a member of the United States House of Representatives. From 1847 till his death he was in the Senate, and in 1860 he was a candidate for the Presidentship which Mr. Lincoln gained. Mr. Douglas as a politician was "a Free-soiler," *i.e.* in favour of each new state or territory settling for itself whether it should admit slavery or not. He was also in favour of the annexation of Texas and the enlargement of the borders of the United States generally.

Douglass, FREDERICK (b. 1817), was born a slave in Maryland, his father being a white man. He was reared a slave, and in 1832 was sold to a Baltimore ship-builder. In 1838 he escaped, and having already educated himself, he was chosen to lecture by the Anti-Slavery Society. He lectured in England as well as in America. In 1847 he started a newspaper, and in 1870 the *New National Era*. In 1871 he was Secretary of the Commission to San Domingo, and in 1872 became a Presidential elector. In 1877 he was made Marshal for the district of Columbia, and afterwards Commissioner for Deeds in the district. His *Autobiography* was published in 1845, and re-published with some changes and additions in 1855.

Doulton, SIR HENRY (b. 1820), was born at Lambeth, and at an early age entered into the pottery works there, studying the business practically from the bottom. In 1846 he turned his attention to the construction of stoneware drain-pipes, and two years later established a drain-pipe factory at Dudley, now the most important in England. But his great achievement was developing the manufacture of art pottery, by which he has made Doulton ware famous throughout the world. He was made Chevalier of the Legion of Honour 1878, received the Albert Medal 1885, knighted 1870.

Douro (the Roman *Durius*), a river of Spain and Portugal, rising in the Pico d'Urbion in the Spanish province of Soria, flowing S.E. and S. past the town of Soria, through the provinces of Burgos, Valladolid, and Zamora, then S.W. and forming the frontier between Spain and Portugal, and falling—after a course of 400 miles, in which it receives several tributaries—into the Atlantic a little below Oporto. Running for much of its course in a deep narrow valley, it is rocky and has rapids and eddies, but is navigable for more than 80 miles from the mouth. It has plenty of fish.

Dove. [PIGEON, RING-DOVE, TURTLE-DOVE.]

Dove, an English river on the borders of Derbyshire and Staffordshire, 4 miles S.W. of Buxton, falls into the Trent a little below Burton after a course of 45 miles. It is famed, first for the beautiful Dovedale—a glen 3 miles in length—through which it flows, and where is some of the most charming scenery in England, and, secondly, for its association with Izaak Walton and Charles Cotton, who fished here and have endeared the name to anglers for evermore.

Dove, HEINRICH WILHELM (1803–1879), a German man of science, was born at Liegnitz in Silesia, and studied at Breslau and Berlin, where he graduated doctor in 1826. He became a professor at Berlin in 1829, and was afterwards made member of the Academy of Sciences and Director of Prussian Observatories. He threw much light upon the laws of climate and meteorological

phenomena. Among his works are *Meteorological Researches* (1837), *The Distribution of Heat on the Earth's Surface* (1852), *Law of Storms* (1857). He also wrote upon Electricity, the Theory of Colours, and many kindred subjects.

Dovekie. [ROTCHE.]

Dover (the Roman *Portus Dubris*). 1. A parliamentary (one member) and municipal borough on the coast of East Kent, a Cinque Port, and the principal port for intercourse with the Continent. It is 66 miles from London, is strongly fortified, and is the chief station of the South-Eastern military district. Everyone is familiar—at least by description—with its white cliffs, and is ready to admit the fitness of the old epithet applied to it: "Clavis et repagulum regni." The Admiralty Pier forms a harbour of refuge, and there are three landing-places, and a fine breakwater. The Castle, which has Saxon and Norman portions, is garrisoned, and there are other forts, batteries, and barracks upon the heights. The Roman *pharos* still exists. Among its public buildings are the town hall, the museum, and the hospital. There is some ship-building, and sail, rope, and paper making, and the Dover pilots are an important body of men. The Lord Warden of the Cinque Ports has his residence near, and three cables put the town in communication with France. Dover has naturally played an important part throughout English history.

2. The capital of Delaware state, U.S., is at the mouth of Jones's Creek, which falls into Delaware Bay, and is 48 miles S. of Wilmington. Leather, cotton, and wool are manufactured, and there is a good deal of fruit-canning.

Dover, STRAITS OF, a narrow neck of water lying between Dover and Calais, and called by the French *Pas de Calais*, joining the North Sea and the English Channel, and having a depth of 6 to 29 fathoms and a width of 18 to 25 miles. The shallowness of the passage and the nature of the opposite coasts seem to prove that the Straits are of comparatively recent geological formation.

Dover's Powder, the pulvis ipecacuanhæ compositus of the Pharmacopœia, contains ipecacuanha one part, opium one part, and sulphate of potash eight parts. Dose, 5 to 10 grains for an adult. It is largely used to promote perspiration at the commencement of febrile attacks, also as a sedative expectorant and as a narcotic.

Dove's Law of rotation of winds is that in north latitudes the tendency of the wind is to veer round in the same way as the sun's diurnal motion—from north, through north-east, east, south-east, and south, back to north through the other points of the compass. The contrary direction prevails in south latitudes.

Dovrefjeld, a group of Norwegian mountains forming the central part of the Scandinavian system, and stretching N.E. from lat. 62° to the rise of the Kölen Mountains, lat. 63°, and rising to the height of 7,620 feet in Snehaetta. Their chief components are gneiss and mica schist.

Dow, GERARD (1613–1675), a great painter of the Dutch school, born at Leyden. He studied under Rembrandt, and while often showing the same vigour and transparency of colouring as his master, he shows the same power of chiaroscuro, and has a fineness and delicacy all his own. A critic, Waagen, has said that his pictures are "nature seen in a camera obscura." His known works are very many, and his favourite subjects were taken from family life.

Dowden, EDWARD (1843), born at Cork, was educated at Queen's College, Cork, and at Trinity College, Dublin. In 1867 he became Professor of Oratory in Dublin University, and afterwards Professor of English Literature. He has written many magazine articles, and is especially noted as a Shakespearean scholar. His *Shakespeare: a Study of his Mind and Art* (1875), and his *Shakespeare Primer* (1877), are well known. He published *Studies in Literature* (1878), a work on Southey in *English Men of Letters* (1879), and a *Life of Shelley* (1888).

Dower is that part of the husband's lands and tenements to which the wife is entitled for her life upon the husband's death. It is regulated by the statute 3 and 4 William IV., chap. 105, which abolished certain kinds of dower, and for the first time gave dower out of equitable estates. It also simplified the way in which dower could be barred or defeated. Except in cases of special custom, as Gavelkind (q.v.), the wife is entitled to one-third of the income of the husband's lands and tenements for her life.

Dowlas, a strong coarse kind of linen formerly in use in England, when it was manufactured in Yorkshire and the Lowlands of Scotland.

Down, a coast county in the S.E. of the province of Ulster, containing 612,399 acres, and having a length of 50 miles by 13 miles broad, with a coast-line of 67 miles. The coast is indented by Belfast and Strangford Loughs and Dundrum and Carlingford Bays. The chief rivers are the Upper Bann and the Lagan, while the Newry Canal and the Ulster Canal give a good water communication. The south is mountainous, and the Mountains of Mourne rise to a height of 2,796 feet. The rest of the country is diversified by hill, dale, and plain, and is fertile. The chief crops are corn, potatoes, flax, and turnips, while pigs, horses, and cattle are reared. Much fine linen and muslin are made at the homes of the people, and there are manufactures of hosiery, thread, leather, woollens, and salt. These are largely exported, as are also corn, butter, pork, and hides. The bulk of the population is Protestant, a large proportion being Presbyterian. The principal towns are Kirkpatrick and Newry. There are many ancient remains of round towers, castles and abbeys, and cairns. Down returns four members to Parliament and Newry one.

Downs, like *dunes*, a name given to the hills and mounds of sand to be found on many coasts, generally shifting, but in some cases gradually rendered firm and coherent by the plantation of trees and grasses. Such dunes are to be found on the coasts of Holland and Belgium, the northern

coasts of France, the coast at the mouth of the Mersey, and the great Belgian waste called La Campine, or Kempenland, which is now far from the sea. 2. To grassy rounded hills such as the North Downs, which pass through mid-Surrey and into Kent to Dover, and the South Downs, which extend from Hampshire to the sea at Beachy Head. The Downs rise to a greatest height of about 900 feet and are for the most part covered with grass, which affords excellent grazing and rears a noted breed of sheep. 3. A roadstead lying between Ramsgate and Deal, from the North to the South Foreland, sheltered by the natural breakwater of the Goodwin Sands, and affording a safe anchorage except against south winds.

Doxology, a hymn of praise to God, specially used in the Church of England to denote the *Gloria Patri*, or the *Gloria in Excelsis Deo*, or some metrical version of these.

Doyle, Sir Francis (1810–1888), an English poet, born near Tadcaster and educated at Eton and Christ Church, where he took a first class in classics in 1831. He was called to the bar, but his mind was chiefly given to poetry and horses. He succeeded to the baronetcy in 1839 and held a post in the Customs. From 1867–77 he was Professor of Poetry at Oxford, and Fellow of All Souls. In 1841 he published *Miscellaneous Verses*, and in 1844 *Two Destinies*. In prose, besides *Two Series of Oxford Lectures* he published an interesting book, *Reminiscences and Opinions*, from 1813–85. Some of his best known poems are *Return of the Guards*, *The Birkenhead*, *The Red Thread of Honour*, *Gordon*.

Doyle, Richard (1826–1883), an eminent caricaturist and illustrator, born in London, and the son of John Doyle, better known as H. B. For some years Richard Doyle contributed to *Punch*, for which he designed the cover, but left it in 1850 in consequence of its attitude upon the Catholic question. He illustrated Leigh Hunt's *Jar of Honey*, Thackeray's *Newcomes* and *Rebecca and Rowena*, Ruskin's *King of the Golden River*, Hughes's *Scouring of the White Horse*, Pontalba's *Fairy Tales*, and did the *Sketches of Modern Society*, which were so conspicuous a feature of the earlier days of the *Cornhill Magazine*. He also practised painting in water-colours.

Dozy, Reinhart (1820–1883), a Dutch Orientalist and historian, who besides being learned in the Semitic tongues, was master of most European languages. He wrote mostly in Dutch or French. Among his chief works are *Histoire des Musulmanes d'Espagne*, *De Israeliten te Mekka*, *Het Islamisme*, a *Detailed Dictionary of the Names of Arab Dress*, and particularly *Catalogus Codicum Orientalium at Leyden*.

Drachenfels, the Dragon's Rock, a noted height of 1,650 feet in the Siebengebirge range of mountains, on the right bank of the Rhine, near Bonn. The height is steep and hard to climb, but now a railway leads to the top. On the top are the ruins of a castle, and it was on this rock that the dragon slain by Siegfried used to dwell. Meredith's *Legend of Cologne* makes a humorous use of the dragon story.

Drachma, an Attic weight, of about 66 grains; the Æginetan drachma weighed about 100 grains; the silver coin of the same name was worth about a franc (*i.e.* nearly 10d.). It contained six obols. The modern Greek drachma is the equivalent of the franc.

Draco, a small constellation in the northern hemisphere. The aberration, or slight change of relative position of the so-called fixed stars, was measured from a star in this constellation, γ *Draconis* by name.

Draco, an Athenian archon and lawgiver of the 7th century B.C. He has become proverbial as a bloodthirsty monster, and his laws have been described as written not in ink but in blood. As a matter of fact he appears to have introduced a period of fixed justice in succession to a period of misrule, and his code was the first at Athens. According to tradition, he appointed death as the penalty for all offences. A recently discovered work of Aristotle represents him as conferring the franchise on all who could bear arms.

Dracæna, a genus of *Liliaceæ*, including one species, *D. Draco*, an arborescent plant, having, unlike most Monocotyledons, a merismatic zone of fundamental tissue in which new fibro-vascular bundles originate, so that the stem increases indefinitely in diameter. The stem bifurcates repeatedly, each branch terminating in a head of linear-lanceolate entire green leaves. The flowers are small, greenish-white, and bell-shaped, in a large terminal panicle, and the fruit is fleshy, three-chambered, and one- or two-seeded. The tree does not branch till twenty-five or thirty years old. It is a native of Teneriffe, where, until blown down by a hurricane in 1867, was an enormous specimen, of unknown age, 70 feet high and 48 feet round, with a staircase within its hollow main trunk. This species yields one of the red resins known as dragon's blood (q.v.). The showy greenhouse plant with red leaves, known as *D. ferrea* or *D. terminalis*, is *Calodracon Jacquinii*, an allied but distinct plant.

Dragoman, in the East, the name for a guide, or interpreter; also for an interpreter attached to an Embassy.

Dragon, a popular name for lizards of the genus Draco, of the family Agamidæ (q.v.). The species, which range over the Oriental region, with the exception of Ceylon, have the nape crested; the hinder ribs are prolonged, and covered with an extensible skin, which forms a nearly semicircular expansion on each side, enabling these animals to take long leaps from bough to bough. Sometimes the term is used poetically, as by Tennyson (*In Memoriam*, lvi.), for the gigantic saurians of Secondary times. The dragon of mythology is a winged serpent, sometimes with two and sometimes with four feet. It seems to be pre-eminently Aryan, and figures largely in Vedic and Greek myths, probably passing from the latter into those

of Western Europe. The dragon was the personification of evil, moral and physical, and the open and avowed enemy of man. This character, which it had in pre-Christian faiths, passed into Christian writings and symbolism, for St. John in the Apocalypse applies the name "dragon" to "that old serpent called the Devil and Satan," and in painting and sculpture of later times the dragon is a symbol of sin, and especially of heresy and schism. Hence to slay the dragon was to confer some great benefit on the human race, and we find such acts ascribed to heroes, gods, and Christian saints. There is, however, a substratum of truth in every myth, and the dragon was probably evolved from

HAROLD OF NORWAY AND THE DRACON.
(*From Olaus Magnus' History of the Northern Nations.*)

more or less exaggerated stories of gigantic serpents. The Chinese dragon, as is shown in a Zoological Note in the *Magazine of Art*, 1891, pp. 371, 372, appears to have been developed from the Chinese alligator; and in 1869 one of these saurians —then generally supposed to be confined to the New World—was exhibited to the populace in Shanghai as a "real live dragon." Not only to the Chinese, but to many other races the dragon was a reality. We read of "fiery flying serpents" in the story of the wanderings of the Children of Israel in the desert, and Cruden, in the 18th century, was firmly convinced "that there were winged serpents." Gesner and Aldrovandi give circumstantial accounts of these animals; and the latter figures more than one kind. These monsters have a duck-like body and feet, with a serpent's head, and greatly elongated neck and tail, and vary only in minor points. But in those days there were mock-dragons, and the same authors give illustrations of some which crafty showmen had exhibited as the real animals. Olaus Magnus (*History of the Northern Nations*, published at Rome, 1555) gives a detailed account of the slaying of a dragon by "Harald, King of Norway." In his youth Harald travelled in the East, and there killed a man, and for this was condemned to be thrown to a dragon. With the aid of his servant, who consented to share his fate, he resolved to turn the tables on the monster. They bribed the keeper, and satisfied the dragon's hunger with some fish. Harald, armed with a sharp knife, then ventured into the den, followed by his servant, who chose for weapon the thigh-bone and skull of a former victim, who, judging from the picture, must have had disproportionately long legs and a very small head. They then despatched the dragon—no very difficult task, unless the artist, as seems probable, has belied the monster. The Celts chose the dragon as the emblem of sovereignty; and a golden dragon figured on the standard of the West Saxons. The Tudors bore it as one of the supporters of the royal arms, till Mary substituted an eagle for it.

Dragonet, any fish of the Acanthopterygian genus Callionymus, with about 30 species, all of small size and generally of brilliant coloration, widely distributed in temperate seas of the Eastern hemisphere. In the males the fin-rays are produced into long filaments. The Gemmeous Dragonet (*C. lyra*) is British; it is about a foot long, yellow with brown spots, and is locally known as the Skulpin, a name given in America to a marine species of Cottus.

Dragon Flies, a number of insects comprising the order Odonata. Their main characters are the similarity of the four wings, the large powerful jaws and incomplete metamorphosis. The skin is hard and is thrown off in a succession of moults to allow of growth. They are carnivorous in all stages; the larvæ and pupæ are both active and aquatic; they have tracheal gills. The principal family is the Libellulidæ, of which the large *Libellula depressa* (Linn.) is the commonest and best known of the fifty British species. The very large size of the eyes and the remarkable arrangement of the genital organs, which enables the male to fertilise the female during flight, are also features of interest. Owing to their powerful flight they are very widely distributed, one species (*Pantala flavescens*) being world-wide. The order is not, however, a very large one numerically: it includes about 1,700 species divided into three families. The largest species belong to the genus *Mecistogaster*, which has an expanse of wing of about 7 inches. The earliest known dragon flies occur in the Lias, but the best preserved ones are from the Solenhofen Slate of Bavaria (Upper Oolite).

Dragon's Blood, a dark red-brown resin, nearly opaque, brittle, soluble in alcohol, ether, and oils; of a fine red colour when powdered, giving off fumes of benzoic acid when heated, and said to have the composition $C_{20}H_{21}O_4$. It coats the cherry-like fruits of *Dæmonorops Draco*, one of the rattan palms of the Malay archipelago, the best quality, moulded in sticks ("sanguis draconis in baculis"), being melted off them, whilst the inferior lump kind ("sanguis draconis in massis") is extracted by boiling. A similar resin exuding from cracks in the trunk of *Draeæna* (q.v.) *Draco*, in the Canaries, gives it the name of Dragon-tree. Formerly valued medicinally as a tonic astringent, dragon's blood is now employed to colour oils and varnishes, to stain horn in imitation of tortoise-shell and wood in imitation of rosewood, in dentifrice, and in plasters.

Dragoon, a cavalry soldier. The earliest regiment of dragoons was raised in England in 1681. They are now classed as *heavy* or *light* dragoons, according to their arms and equipment. Originally they were more like the mounted infantry of to-day. The name is derived from the former ornamentation of the muzzles of their guns with a dragon's head.

Drainage Tubes are used by surgeons in order to facilitate the discharge of collections of matter, and with the view of keeping open a pathway of escape to the surface for deep-lying collections of pus. Thus in uniting the skin surfaces of an amputation wound a drainage tube is usually inserted in order that there may be no accumulation of discharges pent up in the amputation stump. As the wound gradually heals from within outwards the drainage tube is by degrees withdrawn. Drainage tubes are commonly made of indiarubber, and are often perforated by holes, so as to afford abundant scope for the escape of inflammatory exudation.

Drake, Sir Francis, one of the greatest and boldest of the Elizabethan seamen, was the son of a Devonshire clergyman, and was born about the year 1539 near Tavistock. At an early age he was sent as an apprentice on board a trading-ship, the master of which dying, left him the vessel. After a time Drake sold it and embarked in new ventures, first to the Guinea Coast and later to the West Indies. In 1567 he again went to the Guinea Coast, this time with Sir John Hawkins, and to the Spanish Main. Having in these and other expeditions gained much knowledge of the position and riches of the Spaniards in the New World, he in 1592 fitted out two vessels—one the *Pasha* of 70 tons, which he himself commanded, and the other the *Swan* of 25 tons, commanded by his brother John, for what we should now call privateering operations against them. He plundered a number of settlements and took over two hundred ships, and, having greatly enriched himself, returned to Plymouth in 1573. In 1577, at the head of a larger force, he undertook a voyage, in the course of which he circumnavigated the globe, passing through the Strait of Magellan, proceeding to the coast of California, and coming home by Java and the Cape of Good Hope, after rather more than two years and ten months' absence. For his services on this occasion he was knighted, and was visited at Deptford on board his ship the *Golden Hind* by Queen Elizabeth. In 1585, in command of a squadron of twenty-five vessels, and with Martin Frobisher as his vice-admiral, he led an expedition against the Spaniards, plundering Vigo, St. Jago, St. Domingo, and Carthagena, and returning to Portsmouth in 1586. Against the Armada in 1588 he served as Vice-Admiral of England. Seven years later with Sir John Hawkins he sailed on his last voyage, another plundering expedition to the West Indies; and in the course of this, which was his only unfortunate adventure, he died on January 28th, 1596, off Puerto Bello, his end, it is believed, having been accelerated by the death of his old friend Hawkins. His ship the *Golden Hind* was long preserved in England by order of Elizabeth and her successors, and portions of it, made into articles of furniture, are still in existence. Drake, who had married Elizabeth Sydenham, died without issue; but many of the descendants of his brothers rose to honourable positions, and several served with distinction in the royal navy. Sir Francis was a short, broad-shouldered, brown-haired man, of cheerful and engaging manners, and was one of the most accomplished navigators of his day. It would be unfair, since he was encouraged by Elizabeth and loyally served her, to attack his character on account of his deeds; but it cannot be denied that had the Spaniards caught him upon any of his American expeditions they would have been fully justified in hanging him as a pirate.

Drake, Friedrich (1805–1882), a German sculptor born at Pyrmont. He was poor, and while a working engineer he used to carve in wood and ivory to eke out his resources. The sale at twenty-one years old of a head of Christ to an antiquary fired him to new efforts. He went to Berlin, where his talent was recognised by Rauch. His *Virgin with Child* was bought by the Empress of Russia. Among his chief works are *The Eight Provinces of Prussia*, *The Dying Warrior Crowned*, *The Vintage Gatherer*, and numerous statues and busts, including those of Bismarck and Moltke.

Drakenberge (Dragon's Mount), a generic name for the range of mountains between Cape Colony and the Vaal in South Africa. The three chains of which it is composed in the S. unite and run to the N.E., reaching a height of over 10,000 feet, and are crossed by the De Beers and Van Reenen passes at a height of 5,630 and 5,420 feet respectively.

Drama (Gk. *draō*, I do or act). A play may be defined as a composition in dialogue in which the action is not described, but acted or imitated, its aim being to "hold the mirror up to nature"; and the drama may be roughly divided into two kinds—Tragedy and Comedy, with numerous minor divisions. The love of mimicry is inherent in human nature, finding vent in all times and places, and among the rudest savages we can find traces of the fondness for mimic representations of the realities of life, which in civilised societies has produced some of the noblest literary masterpieces. The corroboree of the Australian aborigines and the wild dances of other savage races are forerunners of *Hamlet* and *Faust*, and the games of children are prophetic of the love of the theatre which will obtain in later years. The earliest theatrical representations in Europe originated with the Greeks, both tragedy and comedy being among the many gifts to posterity from that splendid people. We hear of a rudimentary comic drama in Greece from the 7th century B.C. According to tradition, the first comedy at Athens was produced by Susarion and Dolon in 562 B.C., and the first tragedy was written by Thespis 536 B.C. This author's name is still associated with all things dramatic. Both forms had their origin in the dances and choruses in honour of Dionysus (Bacchus), who was the patron deity of the theatre, and the chorus remained a feature of the Greek drama. The golden days of the Grecian theatre commenced with Æschylus, who made use of two actors in addition to the chorus and also introduced the use of scenery, the mask, and the cothurnus or tragic buskin. His most famous countrymen in the writing of tragedies were Sophocles and Euripides; in comedy, Eupolis, Cratinus, and, beyond all, Aristophanes. Of the

new Greek comedy of Menander and others we can only judge by means of Latin adaptations, for though the Romans had rude dramatic beginnings of their own [COMEDY], the theatre with them attained no position till the Grecian drama was introduced about 364 B.C. Seneca, probably the philosophic minister of Nero, is the only Roman tragic writer of whose works we have any specimens, and these productions, bombastic and tedious, do not favourably impress us with the worth of Roman tragedies. Plautus and Terence are their two greatest writers of comedies, but their work is little more than the adaptation of Greek originals. A strange gap, caused, perhaps, by the horror in which the early Christians not unnaturally held such a pagan institution as the theatre, comes between the ancient and modern drama. With the exception of the works of a select school of pedants in Italy, who, perhaps, held that imitation best expressed their admiration, the modern drama has slowly grown up from the miracle and mystery plays of the Middle Ages, by means of which the Church endeavoured to teach the history and mysteries of the Christian religion to an illiterate public. Italy, however, commenced with a series of reproductions of classical models, the earliest tragedy being the *Sofonisba* of Trissino (1502). To the 15th and 16th centuries belong the Pastoral Plays, and in the same centuries Ariosto, Aretino, and Macchiavelli were distinguished as writers of comedy. After a long period of depression the drama was raised to a high place by Goldoni and Alfieri, and amongst later writers may be named Monti, Manzoni, and Niccolini. Until the advent of Corneille the French drama was only distinguished by its mediocrity, but since then French dramatists have taken a foremost position in the history of the drama. Racine, Molière, Voltaire, Beaumarchais stand out conspicuous, and in later days Hugo and Dumas led the attack made by the romantic upon the classical school. Of still more recent writers we may name de Vigny, de Musset, Mérimée, Augier, Scribe, Dumas *fils*, Sardou, and Daudet, who with a number of others have by their wit and ingenuity upheld and increased the brilliancy of the French theatre. It will not be out of place to record that the aid of the State has done much to encourage the art of acting in France, and that the actors of that country have long held the foremost place for polish and finish, as is well attested by such names as Favart, Talma, Rachel, Got, Delaunay, Lemaître, Bernhardt, and Coquelin. In Spain dramatic art attained its highest point with Lope de Vega and Calderon. In Germany Lessing broke the spell of French tradition and practice, but his fame has been overshadowed by that of Schiller and Goethe. Of other prominent writers the most noteworthy are perhaps Körner, Schlegel, Tieck, Grillparzer, and Freytag. The Dutch drama numbers amongst its highest ornaments Koster and Vondel, and of Scandinavian dramatists Holberg, Oehlenschläger, Björnson, and Ibsen are the best known. Turning now to our own country, the history of whose drama we shall trace more fully, we find that the Mystery and Miracle plays gradually gave place in popular esteem to the Moralities, and that these insensibly developed into the drama proper. These early plays were, as their names imply, entirely religious in character, and were at first written and acted by churchmen. The Moralities were allegorical, not historical, and one of the most important characters was the Vice, the lineal predecessor of the modern clown. John Ball is a typical writer of the transition stage of the English drama. He was the author of some of the latest Mysteries and Moralities, which he used as vehicles for bitter attacks upon Popery. But his most interesting production is his play of *King John*, founded upon the chronicles of that king's reign. It is the first historical play, and in a way the last of the Moralities, for amongst its characters we find such personages as Widowed England, Verity, Treason, and Sedition. *Ralph Roister Doister* was the first regular English comedy, and the author was Nicholas Udall (b. *circa* 1504, d. 1556). It possesses considerable spirit and observation of character, relating the adventures and follies of a rich young man surrounded by flatterers and sycophants. This piece was followed by *Gammer Gurton's Needle*, of far inferior merit, written by John Still, Bishop of Bath and Wells. The first tragedy, *Gorboduc; or, Ferrex and Porrex*, was the production of Thomas Norton and Thomas Sackville, Lord Buckhurst, and was acted in 1561 by the members of the Inner Temple before Queen Elizabeth. The theatre in the modern sense of the word had as yet no existence, no separate building having ever been set apart for the performance of plays. The players wandered from place to place, acting in inn-yards, banqueting halls, barns, and other suitable places, and unless under the patronage and protection of some peer or great man, in whose service they were supposed to be, were considered and treated as vagabonds and vagrants. The Blackfriars theatre was opened in 1576 by James Burbage and his company of players, who had been driven from the City by the intolerant persecutions of the Corporation. (For a description of the theatre and the performances, *see* THEATRE.) It is noteworthy that many of the early dramatists were actors, notably Marlowe, Ben Jonson, and Shakespeare. In the later days of Elizabeth and the early years of the reign of James I. the English drama reached a height of splendour such as it has never since approached. Headed by Shakespeare, we find then a band of writers who singly would have shed lustre on their age, who together have rendered the drama of their day unequalled for its poetry, vigour, and profound knowledge of human nature. Lyly, Kyd, Greene, Peele, Marlowe—who first mastered the beauties of blank verse—Ben Jonson, Beaumont and Fletcher, Webster, Tourneur, Middleton, Dekker, Marston, Ford, Massinger are among the more notable of Shakespeare's fellow-workers. Shakespeare himself must stand alone. Under the Commonwealth the performances of stage plays were put a stop to by the Puritans, but on the Restoration Charles II. restored the theatre to favour. A new school arose; the Elizabethan dramatists were considered barbarous and crude;

artifice and wit displaced poetry and nature; and the tastes acquired by the king during his long exile are chiefly responsible for the sensuality and immorality that is the distinguishing feature of the revival of the drama. Dryden, Davenant, and Killigrew may be named as among the earlier, and Shadwell, Settle, Lee, and Otway among the later writers of this period. But the revival is chiefly to be remembered for the brilliantly witty but licentious comedies of Wycherley, who was ably followed by Congreve, Vanbrugh, and Farquhar. Their plays are utterly unreal, the world they depict entirely false; morals there are none, and every character speaks with equal wit and acts with equal indecency. Jeremy Collier, a nonjuring bishop, published in 1628 *A Short View of the Profaneness and Immorality of the English Stage*, a bitter attack on this school of dramatists, which called forth more or less feeble replies from Congreve, Vanbrugh, Dennis, and others, and a more manly confession of guilt from Dryden. These writers were followed by Steele and Addison, whose *Cato* is a strange example of temporary and undeserved success; Goldsmith, who has given the theatre two masterpieces; Colley Cibber, Gay, Garrick, and the brilliant Sheridan, who rivalled in wit any of his predecessors. We now come to what may fairly be termed the drama of the present day, when it is necessary to a certain extent to divide it into two classes—one purely literary, the other theatrical and too often non-literary. In the former class, though some of their plays have been seen on the stage, the chief representatives are Byron, Shelley, Milman, Browning, Tennyson, and Swinburne. Their works—many of them holding a foremost place in the literary productions of our country—have added few to the number of our acting plays, and it appears to be becoming more and more customary for literary men to ignore the theatre as a vehicle for bringing their best work before the public. Talfourd and Planché in lighter work, and Knowles and the first Lord Lytton hold a position somewhat between these two schools of writers of the drama, and the plays of the latter seem to have gained a permanent place in the *répertoire* of our leading actors. The same may perhaps be said of Tom Taylor and W. G. Wills. Of those who may be distinguished rather as playwrights than dramatists we may mention Douglas Jerrold, Charles Reade, Dion Boucicault, Thomas Robertson, and Henry J. Byron, and of writers of farce Matthews and Morton, the author of that immortal farce *Box and Cox*. In recent years the drama has shown some symptoms of revival. It is customary to depreciate English dramatic authors of to-day, and to say that we owe their best work to French originals. To a certain extent this charge is true and borne out by facts, but it is unfair to ignore the large amount of vigorous and worthy work that has been achieved by several of our most popular dramatists. W. S. Gilbert holds perhaps a place apart. He has originated—and as yet had no rivals in their production—the amazingly clever and charming operas which, in conjunction with Sir Arthur Sullivan and other composers, have achieved immense and well-deserved popularity. His more ambitious productions both in comedy and drama are of a high standard of ability, and are distinguished for literary as well as for dramatic power. Robert Buchanan also has given much good work to the stage. Sydney Grundy, Henry Arthur Jones, and Arthur Wing Pinero have written many plays of striking merit, and the popular approval that meets the production of plays of serious import and artistic aim bodes well for the future of the English drama. (*See* THEATRE, TRAGEDY, COMEDY, and the various names mentioned in this article.)

Dramatic Unities. From the study of Aristotle's *Poetics* and the Greek dramatists critics have laid down three rules of dramatic construction: (1) The *unity of time*—the action depicted in a drama must all take place within 24 hours; (2) the *unity of place*—there must be no change of locality; (3) the *unity of action*—there must be no "underplot" or second theme in the play. The observance of these unities marks the classic drama of France. They are occasionally departed from by the Greek dramatists, and are of course quite unrecognised by Shakespeare.

Drammen, a Norwegian seaport on the Dramself, a river falling into the Dramsfiord, an inlet of Christiania Bay. It is 33 miles S.W. of Christiania. The river is the second largest in Norway, and is crossed by three bridges. The town is in three parts and the principal industry is the exporting of timber, and there are also saw-mills and chicory factories.

Draper, JOHN WILLIAM, M.D., LL.D. (1811–1882), chemist and physiologist, was born at Liverpool. He went to America in 1833 and became Professor of Physical Science in a college in Virginia, and later, Professor of Natural History, Chemistry, and Physiology in the University of New York. He contributed much to scientific literature, and made discoveries concerning the chemical action of light. Other works of his are *History of the Intellectual Development of Europe*, a *History of the American Civil War*, *History of the Conflict between Science and Religion.*

Draught, in *Engineering*, means the supply of air necessary for the combustion of coal, coke, or other fuel in a furnace of any kind. This supply may be induced in various ways, which may be classified as *natural* draughts or *forced* draughts. With a column of warm gases passing up an ordinary chimney, a draught is produced simply by the external pressure of the colder air outside overcoming the smaller pressure of the warm gases within. Such a natural draught is intensified by increasing the difference of temperature between the internal gases and the external air, or by lengthening the chimney. On locomotives the natural draught cannot conveniently be increased by lengthening the chimney, and it is therefore assisted by letting the exhaust steam at the end of each stroke discharge itself upwards in the chimney. This has the effect of drawing the air more vigorously into the furnace. Natural draught is also assisted by placing a cowl or small fan at the top of the

chimney. This is rotated by the wind, and acts as a pump to draw the gases up the flue. Constrictions in the flue may considerably modify the draught ; *dampers* are valves placed for the special purpose of varying the draught by introducing greater or less constriction in the flue. True forced draughts are those where the whole supply of air or oxygen is obtained by mechanical means. Thus, it is a general plan to use large pumping engines to force air through the furnace. The supply may be varied at will, and admits of much greater range than is possible with natural draughts. One very convenient means adopted for the production of forced draught in small forges is to work a light fan at quick speed by a long lever. The efficiency of such an arrangement, the supply of forced air passing from the fan to the centre of the furnace, is much greater than that of the ordinary bellows.

Draughts, a game played on a chess-board with twelve men on each side, placed, at the beginning of the game, on alternate squares. These men are moved diagonally, and the object of the game is to capture one's opponent's pieces, which is done by moving over an adversary to an unoccupied square beyond. When a piece succeeds in traversing the length of the board it becomes a "king" and has the power of moving backwards as well as forwards. The game of draughts was known in the 16th century.

Drave (the Roman *Dravus*), one of the chief tributaries of the Danube, rises in the Austrian Tyrol and flows S.E. through the provinces of the Tyrol, Carinthia, Illyria, and Styria into Hungary, which it separates from Slavonia, and falls after a course of 447 miles into the Danube. At first a mountain torrent, it receives many tributaries, and is navigable for 380 miles. A little gold is found in the sands, and there are fine fish.

Dravidians, properly the inhabitants of Dravida (Dravira), which in Hindu geography formed a main division of the Dekkan; but the term is now applied conventionally to all the inhabitants of South India who speak dialects of a now extinct stock language, which differs fundamentally from all other known forms of speech. The Dravidians, who, like the Aryans, probably entered India from the north-west, had already long been in possession of the greater part of the peninsula at the time of the Aryan migration, but were gradually driven by these intruders from the Indus and Ganges valleys southwards to their present domain, that is, the whole region south of Gondwana and the upper course of the Krishna, together with the northern half of Ceylon. Here they form five great nations, speaking five cultivated languages, besides numerous smaller groups speaking uncultivated languages, with a collective population (1890) of considerably over 50 millions, as under: Telugu, 19 millions ; Tamil, 15 ; Kanarese, 9 ; Malayâlam, 5 ; Gondi, 1 ; Tulu, 0·5 ; Khondi, 0·3 ; Orâon, 0·27 ; Kodagn (Coorg), 0·20 ; Rajmahâl (Maler), 0·050 ; Tuda, Kota, Badaga, Kurumba, Irula, Rutluk, Madi (Maria), Keikadi, Yerukâla, and others. The cultivated languages (Telugu, Tamil, Kanarese, Malayâlam, and Tulu) are all written with syllabic alphabets derived from Devanagari [DEVANAGARI], but betray no traces of Sanscrit influences in their structure, though containing considerable percentages of Sanscrit loan words. On the other hand the Dravidian populations have been largely assimilated by secular interminglings with the Aryan populations, so that Peschel (*Races of Man*, p. 451) goes so far as to assert that "the inhabitants of India form at present but a single race, and the separation of the peoples resident between the Himalayas and the Vindhya Hills from the Dravidas of the Dekkan is based solely on the fact that the former speak languages derived more or less directly from the Sanscrit." Nevertheless certain differences are observable between the Aryans and Dravidians, the latter being of much darker complexion and lower stature, with somewhat broader features, more kinky hair, scant beard, rather broad flat nose and dolichocephalic (elongated) skull. Most of these traits point at an admixture of a black element, and it is now generally believed that the Dravidians are not the aborigines, but found the peninsula when they arrived already occupied by a dark Negrito race, which they partly exterminated and partly absorbed. These Negritos may still be represented by certain black and almost dwarfish low caste tribes, such as the savage Kaders, Malsars, Madavars, Paligars, and Pulayas of the Anamaleh Hills and Travancore, the Veddhas both of the mainland and Ceylon, the Irulas, Khotas, and Kurumbars of the Nilghiri uplands. On the other hand there are several groups distinguished either by their finer physique or superior intelligence from the ordinary Dravidian standard. Such are the tall, hirsute Todas of the Nilghiries, probably of Aryan descent; the Nairs (Nayars) and Namburi of Malabar, who claim to be high caste Hindus (Brahmahs or Kshatriyas) ; the Moplahs (Mopilas) and Tirs (Tayars) of Travancore, many of whom are Mohammedans, and all of whom appear to have sprung from alliances between Arab immigrants and the Dravidian natives. Apart from these and a few Christian communities all the Dravidians profess some form of the Hindu religion, and the arts and letters of the civilised natives have been developed under Aryan influences. (Caldwell, *Comparative Grammar of the Dravidian Languages*, 1852 ; Elphinstone, *History of India*, 1841 ; J. Campbell, *Ethnology of India*, in *Journal of the Asiatic Society*, ii. 1866 ; Malleson, *The Native States of India*, 1875.)

Drawbacks, in *Commerce*, are repayments of the whole or part of the duty levied on goods (either manufactured at home or imported) when the goods are exported. They were frequently given in the last century to encourage the importation, trans-shipment, and re-exportation of goods, and therefore the carrying trade of a country. The establishment of bonded warehouses (q.v.) has to a great extent obviated this use of them. Adam Smith speaks of them as "a reasonable encouragement to trade." Whereas a drawback enables goods to be sold to the foreigner at their natural price,

a bounty (q.v.) on export may enable them to be sold to him for less than that price. They were, of course, as stimulating exportation, an essential part of the mercantile system (q.v.).

Drawing Room, a reception of company by the Queen or by some member of the Royal Family acting for the Queen.

Drayton, MICHAEL (1563–1631), an English poet, studied at Oxford, and then received a commission, and fought in the engagement with the Armada. His great work, published partly in 1613 and partly in 1622, was the *Polyolbion*, a poetical topographical account of Great Britain, accurate in details and abounding in fine passages. Other works are *Nymphidia*, *Court of Fairy*, *The Barons' Wars*, *Legend of the Great Cromwell*, *The Battle of Agincourt*, his last being *The Muses' Elysium* (1630). In 1626 he became poet laureate, and was buried in Westminster Abbey.

Dreams. Dreams arise from the fact that the brain is often in a state of partial activity during sleep; hence profound sleep is almost certainly dreamless, though some maintain that even in that condition we do dream, though on waking we do not remember what we have dreamt. The subject-matter of dreams is some previous, and generally recent, mental experience; but we are quite ignorant as to the manner in which this is recalled during sleep. Physical causes also induce and modify dreams; an uneasy position, an overloaded stomach, impeded respiration or circulation, or a low state of health, will generally cause uncomfortable dreams, and the sleep which follows over-indulgence in alcoholic and other stimulants is usually disturbed by wild, fantastic visions. Dreams have played an important part in the history of all faiths. Tylor considers them to have been the germ whence the idea of the soul was first developed amongst races of low culture; and in every faith they have been considered one of the means by which the Divine will was conveyed to man (Job xxxiii. 14–16). [DIVINATION.]

Dredging, a process of removal of matter from the bottom of rivers, lakes, or seas, for scientific or commercial purposes. The instrument required for gathering up specimens, etc., is known as a *dredge*. It consists essentially of a strong square netted bag lined with canvas, with two parallel metal scrapers fixed at a distance apart of about 8 inches on each side of the mouth of the bag. The depth of the bag is about two feet, but varies according to the nature of the work to be done with it. A curved iron handle with ends fixed to each side of the mouth serves as a holder for the dredge, which is raised or lowered by a well-tested rope attached to the middle of the handle. A canvas flap is sometimes used as a lid to the case, to protect delicate specimens within, though not preventing the entrance of fresh objects. Commercial dredging has received a great deal of attention in recent years. So much depends on the clearance of silting or deposition of mud and gravel at the bottom of canals, docks, etc., that it is necessary to devise efficient methods of removal, if the plans for its complete prevention manifest themselves imperfect. Scouring-basins have been introduced in tide-harbours, in which the strong currents due to the tides are made to preserve a clearance in the right localities. Of small dredging-machines the spoon apparatus is an example. It consists of a tough bag of hide or leather attached to a stout iron ring and dragged along the bottom of the waterway at the end of a long pole. The dragging is done by a winch; the loaded bag is lifted out of the water by a crane and emptied into the barge which carries the apparatus. In large continuous dredging operations some form of steam-dredger is used. The bucket-dredger was first employed by Rennie at Hull. The principle is that of an endless chain passing round two fixed barrels, provided with iron buckets at regular intervals. The chain is erected vertically in a steamboat, with one end passing through a long opening at the base of the vessel and reaching down to the level of the cutting. When the chain is rotated, the buckets pass down with one side of the chain to the mud or silt at the bottom of the channel. They scoop up a certain quantity and then pass up on the other side of the chain till in a position to drop their contents into a barge or other near receptacle.

Dreissena, a genus of mussels, differing from the common *Mytilus edulis* by the absence of the pearly internal layer. The best-known species, *D. polymorpha*, is a brackish-water inhabitant and a native of the rivers of the Aralo-Caspian area. It was first observed in England in the Commercial Docks (Surrey) about 1824, but it has since spread into most of the rivers and canals. It appears to have been introduced attached to timber.

Drenthe, a border province of Holland, touching on Hanover, Ober Yssel and Friesland. It contains 1,030 square miles. The soil is poor, and about one-half is peat and bog. The chief pursuits are agriculture, cattle-feeding, and peat-cutting.

Dresden, the capital of Saxony, is on the Elbe, 62 miles S.E. of Leipzig. It consists of two parts —one, Altstadt and Friedrichstadt on the S. bank of the river; the other, Neustadt and Antonstadt on the N. bank. The river is crossed by three bridges, two of which, the Augustus and Albert Bridges, have some architectural beauty, and the other, the Marienbrücke, is for railway and carriage traffic. The town is pretty and pleasantly situated, and is ornamented with squares, statues, and gardens. On the S. bank is a good promenade called the Brühl Terrace. Among its attractions are the Academy of Arts, with fine drawings and architecture, the choir of the Catholic cathedral, the conservatoire of music, the museum with a fine collection of engravings, drawings, and 2,400 pictures — chiefly Italian and Flemish. The Zwinger, once built as the vestibule of a projected palace, is a museum, and the Johanneum, once royal stables, contains a historical museum, a gallery of arms, and a magnificent collection of porcelain. There are also the Augusteum, a museum of antiquities, a royal public library, the royal palace, with a notable collection of

precious stones, etc. The Grosse Garten is a large park of 350 acres. The town has also palaces, a town hall, and fine theatre. Of the churches the chief are the Frauenkirche, the Sophienkirche, and the Kreuzkirche. There are many industries, but Dresden china is made elsewhere. The Elbe furnishes a ready means of communication. Dresden has played no small part in the history of Germany. Of Slavonic origin, it has often suffered in war. Napoleon received here a reverse from Russia; and the town was occupied by the Prussians in 1866.

Dreux, a French town on the river Blaise in the department of Eure and Loir, is situated beneath a hill 25 miles N. of Chartres. On the top of the hill is a castle of the ancient Counts of Dreux, and among the ruins is a beautiful chapel, designed by Lefranc, built in 1816, and now containing the bodies of Louis Philippe and other Orleans princes who died in exile. The town hall of 1513, and the church of St. Pierre—of several periods—are good specimens of Gothic architecture. Dyeing, ironware, leather, and hats, are the chief objects of industry. The Prince de Condé was captured here in 1562.

Dreyse, JOHANN NIKOLAUS VON (1787–1867), the inventor of the needle gun, was born near Erfurt in Prussia. The son of a locksmith, he was apprenticed to his father, and then after his *Wanderjahr* he was employed in an arms factory in Paris (1809–14). He then went home and opened a factory, where he manufactured percussion caps. In 1827 he invented a muzzle-loading needle-gun, and in 1836 the breech-loader, which was adopted in 1840, but did not come greatly into notice till the war of 1866. He was ennobled in 1864.

Driffield, GREAT, a town of the Yorkshire Wolds, in the East Riding, 11 miles N. of Beverley. A canal connects it with Hull, 19 miles away. It is in a fertile district, and there is a considerable trade in corn, cattle, flour, linseed cake, and artificial manure.

Drift. [DILUVIUM, GLACIAL PERIOD, PLEISTOCENE.]

Drill (*Cynocephalus leucophæus*), a baboon from the Guinea Coast, somewhat resembling, but smaller than, the mandrill (q.v.).

Drill, the training of soldiers or other persons to perform certain sets of actions smartly and spontaneously at the word of command or other signal (*e.g.* a musical sound). The process may be said to consist (1) of analysing the actions into their component parts and teaching the persons drilled to distinguish them, (2) in training the persons to perform the separate parts of the action in rapid succession, automatically at a given signal. It is tolerably certain that connections corresponding to the mental association of the signals with the series of actions become organised in the nervous system, so that the motions come to be a case of reflex action (q.v.). In the army drill may be classed roughly as either gymnastic drill, marching drill, or gun drill. The two former are coming to have a very important place in physical education.

Drilling Machine is a special form of lathe used for cutting holes in metal. The centre-line of the machine is generally vertical, the drill working with a rotatory motion and feeding downwards. The material to be drilled is fixed on a circular or rectangular metal table. [BORING.]

Dripstone, in *Architecture*, the projecting moulding over a doorway or arch, usually following the shape of it. The ends are often ornamented with sculpture, sometimes carved into a floral ornament, as in the Decorated style.

Drogheda, a seaport town of Ireland, forming a county of itself, in the S.E. of county Louth, on the Boyne, 4 miles from the mouth of the river, and 32 miles N. of Dublin. A railway viaduct, 98 feet high, here crosses the Boyne. The river admits vessels of 500 tons, and is navigable for those of 50 tons up to Navan (19 miles). Of the population the great majority are Catholic. There are manufactures of linen, cotton, iron, and salt, and brewing and tanning are carried on. There is also a brisk export trade with Liverpool in corn, flour, cattle, butter, eggs, linen, and hides. Cromwell sacked Drogheda in 1649, and put the garrison to death.

Drohobycx, a town of Austrian Galicia, 50 miles S.W. of Lemberg. Of its population about half are Jews. Salt, paraffin, and dye are the chief productions.

Dromæognathæ, a group of Carinate birds, in which the vomer is broad behind. [TINAMOU.]

Drôme, a department in the S.E. of France, noted till the arrival of the phylloxera for its growth of Hermitage. In the south spurs of the Alps rise to a height of 5,900 feet, and the country is hilly, partly covered by forests and furrowed by torrents. But in the Rhone Valley the land is fertile, and the warm climate produces almonds, olives, oilnuts, and mulberries. Wheat, melons, potatoes, and truffles are also abundant. The Rhone separates Drôme from Ardèche on the W., and the Isère and Drôme both flow through the department. Coal, cement, and potter's clay are found. The chief productions are silk, woollen, pottery, iron goods, paper, leather, and glass, and there is considerable trade in raw produce. The department contains 2,508 square miles. The capital is Valence.

Dromedary, a North African variety of *Camelus dromedarius*, bred for riding, and not for carrying burdens. It is much more lightly built than the ordinary camel (q.v.), but has equal, if not greater, powers of endurance. At a swinging trot it can cover from eight to nine miles within the hour for many hours in succession, and some have been known to travel 900 miles in eight days. There are several breeds, varying from cream to nearly white, and some are used for racing.

Dropsy. In this condition there is an accumulation of thin watery fluid in the tissues and serous sacs (pleura, peritoneum, etc.) of the body. A general dropsy, *i.e.* where the whole of the subcutaneous tissues throughout the body are involved

is spoken of as Anasarca; when the accumulation of fluid is confined to the peritoneal cavity the condition is called Ascites. Disease of the heart, Bright's disease, and emphysema of the lungs are causes of general dropsy (anasarca). In heart disease the waterlogging of the tissues is apt in the first instance to affect the most dependent parts, notably the legs. Later, ascites, pleural effusion and œdema of the upper extremities, trunk, and face supervene. The dropsy associated with certain forms of disease of the liver commonly commences as ascites, the swelling of the legs and other parts being a symptom of later development. The conjunctiva is one of the earliest sites involved in dropsy due to renal disease, leading to "puffiness of the eyelids." The treatment of dropsy depends largely upon its cause. In some cases the distension brought about by the collection of fluid in the tissues is extreme and has to be relieved by tapping, and so permitting the escape of the accumulated fluid.

Droseraceæ, a small but widely distributed order of herbaceous plants allied to the saxifrages. They have generally white flowers with five sepals, five petals, five, ten, or fifteen stamens, and three to five styles, the ovary being one-chambered and forming a many-seeded loculicidal capsule. They are marsh plants with but slightly developed roots and are all apparently carnivorous plants (q.v.). *Drosera*, the largest and most widely dispersed genus, gets its scientific name and the popular name, sundew, from the drops of viscid liquid excreted at the apex of the hair-like "tentacles" or lobes of its leaves. This secretion, present in several of the other genera, is absent in *Dionœa* (q.v.), where its function is replaced by the instantaneous electrical folding of the leaves. Drosera is reddish, having little chlorophyll, and its flowers are small and often cleistogamous.

Drouet, Jean Baptiste, Comte d'Erlon (1765–1844), a French general, served (1793–96) in the campaigns of the Moselle, Sambre, and Peninsula; he gave the turning point to the victory of Jena (1806), and was badly wounded at Friedland in 1807. He commanded the 1st corps d'armée at Waterloo, but through conflicting orders remained inactive. After Napoleon's fall he for a time brewed beer at Munich, but returned to France when the amnesty was granted in 1825. In 1834–5 he was Governor of Algeria, and became Marshal in 1843.

Drouyn de Lhuys, Edouard (1805–1881), a French statesman and diplomatist, entered the diplomatic service in 1830. He was chargé d'affaires at the Hague when the Belgian revolution broke out. In 1840 he was head of the commercial department of the foreign ministry, but he opposed Guizot in the Chamber, which he entered in 1842, and lost office in 1845. He became foreign minister again under Odillon-Barrot in 1848, English ambassador 1849, and foreign minister from 1851, after the *Coup d'État*, to 1855. He was for a time head of the State railways, and he endeavoured to prevent the Crimean war. In 1862 he was again foreign minister, and tried to bring about the reconcilement of Rome and Italy. After the Prussian war of 1866 he was in favour of French intervention. After the fall of Napoleon III. he retired to Jersey, but afterwards returned to France, where he died.

Droz, Gustave (b. 1832), a French novelist. He at first studied art, but turned to literature and proved a success in *La Vie Parisienne*, where he wrote over the signature "Gustave Z." His *M., Mme., et Bébé*, *Entre Nous*, and *Cahier Bleu de Mlle. Cibot* appeared in that journal. Other works of his are *Cahier d'une Femme Mariée*, *Autour d'une Source*, and *Un Paquet de Lettres*. He shows much versatility and delicacy of sentiment, together with talent and wit.

Drugget, a coarse fabric, either all wool, or one half wool and the other cotton, linen, or silk. The name, which is French, is of doubtful origin. Druggets are used to protect carpets, or instead of them, the finer kinds being used as table covers, etc. A similar material (half linen) was formerly used as clothing.

Druidism, the religion of the Gauls and Ancient Britons, formerly thought to be a distinctively Celtic faith, but Professor Rhys (*Celtic Heathendom*) maintains that these peoples derived it from a pre-Celtic and non-Aryan race. If this be so, the tradition of such a race had died out in Gaul hard on 2,000 years ago, for the Gauls asserted that they were autochthons (Cæsar: *de Bell. Gall.* vi. 18). According to Cæsar, who had opportunities of studying it on the spot, Druidism originated in Britain, and passed thence across the Channel. It seems to have been primarily a system of nature-worship, which in time became tinged with Eastern philosophy, and to have had an exoteric and an esoteric side, though, contrary to what one would expect, metempsychosis was taught to the people. The Druids, who formed a distinct class, were not only priests who offered sacrifices and taught the people their duties to the gods; they also acted as judges in civil and criminal affairs. Unlike the German priests they took no part in war. The novices had to undergo a long training, sometimes lasting twenty years, and the secret lore was committed to memory, "for they did not want their doctrines to be published to the vulgar." Cæsar tells us that the Druids could write and made use of Greek characters. This probably explains whence they got the idea of metempsychosis. He gives a circumstantial account of some of their terrible human sacrifices. Their practice seems to contradict their doctrine, for it is hard to conceive men holding the doctrine of transmigration of souls offering human sacrifices, or indeed any involving the death of the victim. Many of their sacred rites were performed in groves, and they considered the oak-tree sacred. Indeed, some derive the name Druid from the Greek *drus*, an oak, but Skeat considers it to be from the Irish *druidh*, an augur. The Druids were intensely patriotic, and roused the people against the Roman invasion, so that Claudius forbade Druidical rites to be practised, and Suetonius Paulinus, in 61 A.D., massacred a great number of Druids in Anglesey, when he

put down the rebellion in the island. [CARNAC, STANDING STONES, STONEHENGE.]

Drum, in machinery, is a hollow cylinder, round which ropes or chains may be wound for convenience of storage. The term is also used to denote wide pulleys fixed on shafting, from which belting passes to different machines. The drum-armature [ARMATURE] is an arrangement in which coils of wire are wound lengthwise round a cylindrical drum in such a way as to enclose it completely. The wire is in several sections, the two ends of each section being carefully separated so that any electric current that is induced in the wire by rotation of the armature in a magnetic field may be withdrawn and utilised. [DYNAMO-ELECTRIC MACHINERY.]

Drum. The drum known to the Greeks was pre-eminently the instrument of the Earth-mother, Cybele, and was used in her worship. She was a Phrygian goddess, and the drum is probably of Phrygian or Syrian origin. According to one Greek legend, which also seems to have taken its rise in Phrygia, it was invented by the Corybantes (q.v.) to drown the cries of the infant Bacchus, when his father Zeus sought to slay him. These drums were, however, like the modern tambourine (q.v.) in construction, but some represented in vase paintings are (like the modern kettledrum) a hollow hemisphere of metal, across the opening of which is stretched a surface of parchment. The presence of the metal greatly increases the definiteness of the sound. The drum seems to have passed from Western Asia to India, and was introduced into European armies either by the Crusaders or the Moors of Spain. It is mentioned by Froissart at the entry of Edward III. into Calais (1347). Modern drums are of various types. The *kettle-drum*, from its construction (*see* above), is the only kind that can be accurately tuned, or that can be said to give out definite musical notes. The *side drum*, the best known military type, consists of a hollow wooden or brass cylinder, with a head or membrane stretched tightly across each end and fastened round a hoop. A larger hoop presses this down, and cords which can be tightened connect the two heads. Cords of catgut, called *snares*, are stretched across the lower end (when the drum is hung vertically) and rattle against it when it is struck. At military funerals it is "muffled" by putting cloth between the snares and the membrane. The "roll" (two blows with the left drumstick followed by two with the right, and so on in rapid succession) requires a special knack in the drummer. The bass drum is a cylinder usually rather long in proportion to its breadth, played with one stick, commonly of whalebone. The sticks for side drums are of hard wood, terminated by a knob. Gong drums, in shape like a large tambourine, are occasionally used in orchestras. Though regular military drum calls expressed in musical notation exist, yet the drum is so imperfect an instrument in giving distinct sounds that the bugle is usually substituted. All the types are used in orchestral music.

Drum Major, the chief drummer in a regiment, or, more properly, the non-commissioned officer (now called sergeant-drummer in the English army), whose business it is to transmit orders to the drummers.

Drummond, THOMAS (1797–1840), an English captain of Engineers, was born at Edinburgh. After studying at Edinburgh and at Woolwich, where he invented a pontoon and gave other proofs of talent, he entered the Engineers. He was appointed assistant to Colonel Colby in making the trigonometrical survey of Great Britain and Ireland, and in the latter country he achieved success with the limelight which he had invented, and enabled a signal to be seen at 66 miles distance in spite of foggy atmosphere. In 1835 he became Under-Secretary for Ireland, and for five years gave great satisfaction by his sympathy with Irish ideas, and his wise administration.

Drummond, WILLIAM, of Hawthornden (1585–1649), a poet who has been called the "Scottish Petrarch." He was born at Hawthornden House, and after studying at Edinburgh University, he travelled abroad for four years, spending part of the time at Bourges in the study of the civil law. He then retired to Hawthornden, and gave himself up to poetry and literature. Ben Jonson paid him a short visit in the winter of 1618, and he made notes of Jonson's conversation, which were published in 1741. In his poems he abandoned the Scottish dialect for the Elizabethan English then in vogue. He has been thought to resemble Milton in style. Some of his chief works are the *Cypress Grove* (prose), a set of reflections upon death, *Polemo Middenia; or, Battle of the Dunghill*, and a history of the lives and reigns of the five Jameses of Scotland. His style was ornate, his views were High Church, and he was devoted to the Stuarts. Indeed, the death of Charles I. has been said to have hastened his own.

Drupe, a succulent fruit composed of one carpel, superior, and containing one, or rarely two, seeds. It is characteristic of the sub-order *Drupaceæ* of the *Rosaceæ*, the "stone fruits," such as plums, cherries, apricots, peaches, etc., and has a pericarp (q.v.) of three distinct layers: the *epicarp* or skin, the *mesocarp*, generally fleshy, and the *endocarp*, or stone, containing the seed ("kernel"). The epicarp may be glossy, as in cherries; glaucous, as in plums; or woolly, as in peaches. The term is often loosely used of somewhat similar fruits, such as the syncarpous olive, the date, in which the "stone" is a seed, and the walnut, which is inferior and bi-carpellary.

Drury Lane Theatre was first opened in 1663. This building was burnt, and another on the same site, built by Wren, opened in 1672. Garrick (q.v.) acted Shakspeare's plays here, and the best period of the theatre was under his management. The building was again burnt in 1809, and reopened with a prologue by Lord Byron. It was this fire that occasioned *Rejected Addresses*. Macready and Charles Kean (q.v.) were also among its lessees. With Covent Garden, it was opened under a patent from the Crown, and it is owned by a body of "renters," whose rights to admission have long been a source of friction with the various lessees.

Drusus, MARCUS LIVIUS. 1. Tribune of the Roman people 122 B.C. He opposed Caius Gracchus by outbidding him, especially by proposing the planting of colonies. 2. Son of the above, was also tribune, and thongh an opponent of the democrats, attempted to meet the Roman economic and political crisis in 93 to 92 B.C. by further agrarian reforms and foundations of colonies, as well as by proposing the enfranchisement of the Latin and Italian subjects of Rome. Probably on the latter account, he was assassinated in 91 B.C.

Drusus, NERO CLAUDIUS (38 B.C. to 9 A.D.), was the brother of the Emperor Tiberius. He extended the Roman sway in Germany to the Ocean and the Elbe, and received the title "Germanicus," which, however, is applied more particularly to his son. He was the father of the Emperor Claudius by Antonia, daughter of Mark Antony.

Druzes, a Syrian people, on the east slopes of Mount Lebanon, whence many have in recent years migrated to the Haurân uplands south of Damascus; they are of doubtful origin, but probably akin to the neighbouring Nazariehs, and like them practise certain mysterious rites supposed to be instituted in the 10th century by Hâkim, third Sultan of the Egyptian Fatimite dynasty, and afterwards propagated by Mohammed ed Derâzi, a Persian fanatic, who led his followers out of Egypt and established himself in the Lebanon; from him they take the name of Derûz or Drûz, and associate with him another Persian named Hamza, by whom their present code appears to have been formulated. They reject prayer, fasting, pilgrimage, eat pork and drink wine, and their claim to be regarded as Mohammedans is consequently rejected by the orthodox Mussulmans. They believe in one God, who has manifested himself several times, the last incarnation being that of Hâkim. There is also an esoteric or secret doctrine, revealed only to the okkâl (initiated), who meet once a week, but whose gatherings are supposed to be more of a political than of a religious character. The Druzes, who are an extremely warlike people, brave, intelligent, and physically superior to all the surrounding populations, have for ages been at feud with the neighbouring Christian Maronites [MARONITES], and towards the middle of the present century frightful massacres took place on both sides, leading to the intervention of the European powers. Since then peace has been maintained, and the Druzes, who have given a friendly welcome to the Protestant missionaries, have discontinued their warlike expeditions, devoting themselves to agriculture and other peaceful pursuits. They number altogether about 100,000, of whom the majority are now settled in Haurân. (Colonel Churchill, *The Druzes and the Maronites*, 1862; De Sacy, *Exposé de la Religion des Druzes*, 1838; Guy's *Théogonie des Druzes*, 1863.)

Dryad. [NATURE WORSHIP, NYMPH.]

Dryden, JOHN (1631–1700), an English poet (the "glorious John" of Claud Halcro in Sir Walter Scott's *Pirate*, was born of an ancient family in Northamptonshire. He was a King's scholar at Westminster under the famous Dr. Busby, and a scholar of King's College, Cambridge. He came to London, and was secretary to his cousin, Sir Gilbert Pickering, and was a favourite of Cromwell, whose death gave occasion for his *Heroic Stanzas*. At the Restoration he became a King's man and wrote *Astræa Redux*. In 1661 he produced his first play, *Duke of Guise*, and in 1663 *The Wild Gallant*, which was not a success. In the same year he married Lady Elizabeth Howard, and collaborated with Sir Robert Howard to produce the *Indian Queen*—a tragedy on Montezuma, in heroic verse. This was followed by the *Indian Emperor*, which won great admiration. His *Annus Mirabilis* commemorates the year 1666, and in 1668 appeared his *Essay on Dramatic Poetry*, as well as *The Maiden Queen*. In 1670 he helped Sir William Davenant (q.v.) to produce a new version of Shakespeare's *Tempest*. He was appointed Poet Laureate and Court historiographer. He produced many pieces for the stage, and in 1681 appeared *Absalom and Achitophel* (Monmouth and Shaftesbury). In the *Medal* he attacked sedition, and in *Mac Flecknoe* satirised his brother poet Shadwell. Having become a Catholic in 1685 he wrote *The Hind and the Panther*, in defence of his new religion. He lost his offices at the Revolution, and it was in the following years that he did some of his best work. He translated (with Congreve) Juvenal, Persius, and the *Æneid* (1697). *Alexander's Feast*, and his *Fables*, which may be called translations of Boccaccio and Chaucer, are of this period. A keen satirist and writer of good prose and vigorous verse, he had a great influence upon his time. He was buried in Westminster Abbey. Scott wrote a good life of him in 1818, and Mr. Saintsbury has done so since.

Dryophis, a genus of arboreal innocuous colubriform Snakes, the type of a family (Dryophidæ) popularly called Whip Snakes, from their long, slender form. They are natives of tropical America, West Africa, and Madagascar, generally green in colour, and the snout is much prolonged.

Dryopithecus, an extinct genus of Anthropoid Apes from the Miocene of France. They were as large as gorillas; probably arboreal and frugivorous in habit, and, according to M. Lartet, their dentition was more man-like than that of any living Anthropoid.

Dry Pile, in *Electricity*, is a battery in which the liquid is replaced by some such substance as paper or leather that will absorb sufficient moisture to assist the chemical action. Instead of using a few cells, many hundreds are ranged one on the other in a column. In Zamboni's dry pile each cell consists simply of a disc of paper about one inch in diameter, silvered or tinned on one side and coated with a thin layer of black manganese oxide on the other. From one to two thousand of these are piled up so as to form a cylinder, which need not be greater than twelve inches in length. It is enclosed in a glass cylinder with a brass cap at each end making contact with the pile. Dry piles last for many years; they give no shock or spark, but are useful for charging condensers.

Dry Point. [ETCHING.]

Dry Rot, a disease in timber destroying its fibres into a mass of powder. In oak it is commonly produced by the mycelium or spawn of the fungus *Polyporus hybridus;* in coniferous wood by *Merulius lacrymans*, the growth of which is especially promoted by want of ventilation, and the presence of moisture and warmth. The careful selection of sound wood suitable for the purpose, leaving it, if possible, unpainted so as to allow air to pass through it, and careful seasoning, as by soaking in running water or in salt, are all recommended as preventives. The best, however, is creasote or heavy tar oil, which is forced into the wood at a temperature of 120° Fahr. under a pressure of 150 lbs. per square inch. A cubic foot of fir will absorb 8 to 10 lbs. of creasote. The creasote coagulates all the albuminoids in the wood. If the disease has begun, corrosive sublimate may be effectual in checking it.

Dual. In nouns, pronouns, and verbs in some of the Aryan and Semitic languages, besides the inflexions of the singular and plural, there is a third set, expressing the existence or action of two persons or things. This "dual number" is probably older than the plural, and usually is tending to disappear. In Sanscrit and ancient Greek it tends to disappear. In some dialects of the latter it is not found at all, and it had vanished altogether by the time of Alexander the Great. In Latin there is only one trace of it (in *ambo*, both), and it is not found in the Germanic languages.

Dualism. 1. In *Philosophy*, the recognition of two distinct conflicting principles or deities in the world. [MANICHÆANS.] Christianity is not properly dualistic, as it regards the powers of evil as created and temporary. 2. In *Chemistry*, dualistic doctrines regarding the constitution of bodies largely prevailed during the early portion of the present century, chiefly through the influence of the Swedish chemist, Berzelius. He regarded all elements as either electro-positive or electro-negative, and thought that compounds were always formed by the union of oppositely electrified atoms, such compounds being themselves positive or negative according to whichever kind of electrification was in excess. Two compounds could then unite with one another, but it was essential that one should be positive and the other negative. He supposed all salts to be formed by the union of two oxides—one an acid electro-negative oxide, the other a basic electro-positive oxide, and extended his dualistic ideas to substances other than salts or organic compounds. Acids were regarded as compounds of acid oxides with water, and hence all acids should necessarily contain oxygen. The proof of the existence of acids in which this element was not present, *e.g.* hydrochloric acid, HCE, prussic acid, HCN, was one of the first blows to these ideas. Another tenet of the theory was that no atom could take the place of an oppositely electrified atom in a compound. The discovery of compounds in which elements such as chlorine may replace hydrogen with but little alteration in the general properties of the compound, *e.g.* in chloracetic acid, was in direct contradiction to the dualistic views and finally led to their overthrow and the formation of a type theory, which might be regarded as the foundation of the present system of chemical classification.

Duality, PRINCIPLE OF, in *Geometry*, means that many theorems relating to points and lines in one plane must exist in pairs. The reason may be briefly stated thus: a line is completely determined if we know two points on it, and may therefore be regarded as the product of those two points. If the points are named A and B, the line is named AB. Conversely, a point is completely determined if we know two lines through it, and may, therefore, be regarded as the product of those two lines. If the lines are named *a* and *b*, the point is named *ab*. Hence, three points determine three lines, and three lines determine three points. Corresponding to a series of points in a line, we should speak of a series of lines through a point. The correlation of lines and points being thus suggested, we may cite Pascal's theorem and its correlative, Brianchon's theorem, in illustration of the principle of duality. The former states that if six points be taken on any conic section, and a six-sided figure be drawn by finding six consecutive lines that are determined by these points, then the intersections or products of opposite sides of the figure will be three points in a line. The second may be deduced from the first by interchanging the words "line" and "point" throughout. Thus, if six lines be taken on any conic section (*i.e.* six tangents), and a six-pointed figure be drawn by finding six consecutive points that are determined by these lines, then the products of opposite points of the figure will be three lines through a point. In solid geometry the principle of duality similarly applies to points and planes, a plane being determined by three points and a point by three planes.

Du Barry, MARIE JEANNE, COMTESSE (1746–1793), a mistress of Louis XV., was born at Vaucouleurs. Coming to Paris young, she became the mistress of Jean Du Barry, and was introduced to the king in 1769. He married her to the Count Du Barry, the brother of her former protector, as a cloak to his own connection with her. She ruled the king, and had great influence in the disposal of privileges and offices. After the death of the king she was sent to a convent, and received a pension from Louis XVI. She was guillotined during the Reign of Terror.

Dublin. 1. A county on the east coast of Ireland, in the province of Leinster, having a length of thirty-two miles, a breadth of eighteen, and an area of 354 miles, and a coast-line of seventy miles. Dublin Bay is the chief indentation. The Liffey flows from west to east, and the Royal and Grand Canals unite it with the Shannon. The surface is generally level, but in the south there are high lands rising to a height of 2,473 feet, and there is much picturesque scenery. The land is much divided, and nearly one-third is cultivated. The northern parts are level and tame, but fertile and beautifully green. There are many seats in the

southern parts. The country is not rich in minerals, nor are there many manufactures. Fishing employs a fair number of people. The county returns two members to Parliament.

2. The capital of Ireland, is on the east coast of the county of Dublin, and within a mile of Dublin Bay, which is six miles across. The city is divided almost into halves by the Liffey, which flows into the bay, and the river embankments on either side form a magnificent line of quays through the city, though their beauty is somewhat marred by the foul state of the river. There is a harbour between the North and South Walls, the latter of which runs out for three and a half miles and terminates in a lighthouse. There is also a harbour of refuge at Kingstown. The river is crossed by six stone bridges, three of iron, and one swing bridge. The old town is irregular, but the streets parallel to the Liffey and at right angles are regular. Most of the houses are brick. Two canals also pass through the city. The finest street is O'Connell Street, which is 650 yards long and 40 wide, and has in it a Nelson column and a statue of O'Connell. The O'Connell Bridge is of the same width as the street, and has a central footway. A railway connects the north and south, and there are four railway stations. The public buildings are very fine. On the east is the Castle, the official residence of the Lord Lieutenant. It dates from the 13th century, and has a fine Gothic chapel. East of the Castle is the Bank of Ireland, formerly the Parliament House, and at right angles to it is Trinity College, on the opposite side of College Green. The Four Courts are on the quay. Besides these there are the custom house, the Rotunda, the King's Inns, the post office, the corn exchange, the mansion house, and many other buildings, including many scientific institutions, hospitals, infirmaries, and barracks, and the city is well supplied with statues. The Royal barracks at the west accommodate 5,500 men. Besides St. Patrick's cathedral (1190) and Christ church (1038), there is a Roman Catholic cathedral and the fine church of St. George. Phœnix Park in the north-west, some distance up the Liffey, contains 1,759 acres, and is one of the finest parks in Europe. In it is the viceregal lodge, standing in its own grounds of 160 acres, and a Wellington column. To the north of the park is Glasnevin cemetery, in which many renowned Irishmen are buried, the latest being Charles Stewart Parnell. The chief industries of Dublin are brewing, distilling, and the manufacture of poplin. The city returns four members to Parliament. Dublin University was originally founded in 1320 and refounded in 1591. At present Trinity is its only college. This corporation consists of a provost, seven senior fellows and twenty-six junior fellows, and seventy foundation scholars. The fellowships are tenable for life, and the senior fellows are elected from among the juniors, who are appointed by the provost and senior fellows after examination. Degrees are granted by the senate of the University, subject to the consent of the College Board, and a right of veto exercised by the *caput* of the Senate—*i.e.* the chancellor, vice-chancellor, provost, and senior non-regent master, any one of whom may veto a degree. The college is administered by a board consisting of the provost and the senior fellows. In many features the college life resembles that of the older universities. Lever in *Charles O'Malley* gives us a

O'CONNELL (SACKVILLE) STREET, DUBLIN. (*From a Photograph by W. Lawrence, Dublin.*)

lively picture of the life in the early part of the century. There is a good library, which is yearly increasing under the provisions of the Copyright Act. The university returns two members to Parliament.

Dubois, GUILLAUME, cardinal and prime minister of France (1656–1723), was born at Brive la Gaillarde. He was appointed tutor to the Duke of Chartres, who afterwards became regent. Like a celebrated head-master of later years he taught his pupil well, but took no heed of his morals; indeed, he is said to have encouraged him in vice to get a firmer hold on him. In 1692 he persuaded the duke to marry Mdlle. de Blois, daughter of Louis XIV., and this added to his influence at court. He was appointed ambassador at the English court. He was addicted to wine, women, and play, but, as the king said to his traducers, he did not get drunk, get inveigled, or lose at cards. At the king's death the duke's mother exhorted her son to send off "ce fripon," but failed in the endeavour. In 1715 he was very powerful, in 1717 negotiated the Triple Alliance, in 1721 was cardinal, and the next year prime minister. But hard work and debauchery—burning the candle at both ends—at last killed him.

Dubovka, a Russian town in the province of Saratov, on the Volga. It has tanneries and a trade in mustard and salt.

Dubuque, capital of a county of the same name, in Iowa, United States, 198 miles north-west of Chicago. It is on the right bank of the Mississippi, and is partly upon bluffs 200 feet above the river, which is here crossed by an iron railway bridge. There are Roman Catholic and Episcopalian bishops, and many churches, a city hall, a custom house, and a German Presbyterian seminary. It is the centre of the north-western lead region, and owes its name to a Frenchman who settled here for lead mining in 1788. It has some manufactures and considerable trade.

Du Cange, CHARLES DUFRESNE, SIEUR (1610–1688), a French historian and linguist, born near Amiens. He was educated at the Jesuits' College in Amiens, and then at Orleans and Paris. In 1631 he became a parliamentary advocate at Paris, and in 1645 royal treasurer at Amiens. In 1668 he came to Paris and devoted himself to literature. Among his works are *Glossaries of Greek and Latin of the Middle Ages and Modern Times*, *Historia Byzantina*, *Annals of Zonaras*, *Numismatics of the Middle Ages*. He has been called the French Varro, and was esteemed as much for his modesty and self-denial as for his high character and pure morals.

Ducat (Ital. *ducato*, belonging to a duke), a coin said by some authorities to have been introduced by Longinus, Exarch or Duke of Ravenna. According to Professor Skeat, it was first coined in the duchy of Apulia in 1140 B.C., and derived its name from an inscription on it, commending the duchy to Divine protection. The name was used in many European states for gold and silver coins down to the end of the first half of the present century. The gold ducats of Venice, also called sequins or zecchini, were worth about 6s. About 1835 the German gold ducat, though slightly different in different states, was usually worth about 9s. 3d. Russia, Sweden, and Holland also had gold ducats, each worth about 8s. 4d., while Venice and Naples had silver ducats worth approximately 3s. 6d. (with silver at 5s. per oz.).

Duchesne, ANDRÉ, was born in the Touraine, France, in 1584, and from his boyhood showed a keen interest in archæology and geography. His first work, published when he was eighteen, displaying considerable erudition, Richelieu became his patron, and made him historiographer to the king. Among his voluminous works may be mentioned *Les Antiquités et Recherches sur la Grandeur des Rois de France*, *Les Antiquités des Villes, Châteaux, etc.*, *Histoire d'Angleterre, d'Ecosse, et d'Irlande*, *Historiæ Normannorum Scriptores*, etc. He left a great mass of manuscripts, which served as materials for his son François, also an eminent antiquarian. Duchesne died in 1640, having been run over by a carriage in the neighbourhood of Paris.

Duchesne, LE PÈRE. [HÉBERT.]

Duchesne, JEAN BAPTISTE JOSEPH, born at Gisors, France, in 1770, acquired a high reputation as a miniature painter, exercising his art until within a year or two of his death in 1856. He continued Petitot's series of enamels in the Louvre, and his portraits of Napoleon I., Louis Philippe, the Duchesses of Angoulême and Berry, and other historical personages, are highly interesting.

Duck, a book-name for any of one division of the Anatidæ, a family of Swimming Birds, containing the True Ducks, Geese and Swans. It is universally distributed; but the species are most abundant in temperate and cold climates, and one of the most important genera, economically, is Arctic. [EIDER DUCK.] In this family, which contains 40 genera with 180 species, the feet are very short, and the lower leg covered with a network of scales in front; the bill is almost straight, rounded at the extremity, and having the nostrils at the base; the hind toe, which is small and does not touch the ground, is present in all the species. When, as is sometimes done, the Flamingoes are included in the family, it is equivalent to the old group Lamellirostres, so named because the beak is furnished on each side with a series of transverse plates which act as strainers to sift the mud in which these birds for the most part seek their food. In the type-genus Anas the legs are rather short, and placed centrally under the body; the wings are rather long and pointed, and the tail pointed or wedge-like; the sexes differ in plumage. The Mallard or Wild Duck (*Anas boscas*), widely distributed, is a British bird, still abundant, though its numbers have been reduced by the reclamation of the fen-lands. The male, about 24 inches long, is exceedingly beautiful. The head and upper part of the neck are deep emerald green; a white collar divides this from the brown of the lower part of the breast; the back is a mixture of black and brown, there is a bright-blue spot on each wing, and the central tail-feathers are

recurved. The female is somewhat smaller, and her plumage shades of brown. At the end of the breeding season the male assumes a dress much like that of his mate, recovering his brilliant appearance in the autumn. They frequent lakes and rivers, feeding on aquatic vegetation and insects, molluscs and crustaceans, worms, frogs, and fish-fry. The nest is composed of grass lined with down, and contains about a dozen eggs. The wild species has a single mate, but when domesticated becomes polygamous. From this species all the varieties of the Domestic Duck are descended; but none has the fine plumage of the wild bird, the Rouen ducks approaching it most closely, while the Aylesburys are white and the Labradors black. [POULTRY.] Other British fresh-water ducks are the Gadwall, Garganey, Pintail, Shoveller, Teal, and Widgeon (all which see).

Duck Bill, Duck Mole. [ORNITHORHYNCHUS.]

Ducking Stool, or CUCKING STOOL, in mediæval England an instrument of punishment for scolding women. Strictly speaking, the delinquent was placed in a cucking stool at her own door as in a pillory, to be jeered at by the populace, or sometimes she was conducted round the town in it mounted on a handcart or *tumbril;* while the ducking stool proper was a chair mounted at the end of a pole, which projected over a pond or river, and by a kind of seesaw arrangement allowed the victim to be dipped repeatedly until her passions had been cooled. One or other of these instruments was possessed by Derby, Chester (where it is mentioned in Domesday Book), Leicester, Gravesend, Cambridge, Banbury, and other towns. A woman was actually ducked in the ducking-stool at Chesterfield in 1790, and at Leominster in 1809. (*See* Jewitt in the *Reliquary*, vol. i.; 1860.)

Duckweed, or DUCK'S MEAT (*Lemna*), a curious genus of floating aquatic plants, represented by four British species, and forming the type of the order *Lemnaceæ*, which is related to the aroids. They have floating frond-like green stems, which reproduce themselves by buds. From their margins long simple roots with prominent root-caps hang down into the water. The flowers, somewhat rarely produced, are in a small spathe in a lateral notch on the stem, and consist of one or two stamens or of a single one-chambered one-seeded ovary, with no perianth. They are among the most minute of flowering plants.

Duckworth, SIR JOHN THOMAS, British admiral, son of a vicar of Stoke Pogis, was born at Leatherhead in 1749, and, having entered the royal navy, was present when only ten years of age at the victories of Boscawen and Hawke in 1759. He became a lieutenant in 1770, and as such took part in Byron's action in 1779, immediately after which he was made a commander. Promotion to captain followed in 1780. He was captain of the *Orion*, 74, at the battle of "the Glorious First of June," 1794, and of the *Leviathan* at the attack on San Domingo in 1796. Three years later he was made a rear-admiral, and became second-in-command under Nelson at Naples. After rendering various valuable services, and capturing a number of islands in the West Indies, he was so fortunate, on February 6th, 1806, as to fall in, off San Domingo, with a French squadron under Rear-Admiral Leissègues, and, after a warmly-fought action, to capture or destroy the whole of it except two frigates and a corvette. For this victory he received the thanks of both Houses, a pension of £1,000 a year, the freedom of the City, and other honours. He next became second-in-command, under Collingwood, in the Mediterranean; and in 1807 took his division of the fleet up the Dardanelles, engaging the Turkish batteries both going and returning. He was afterwards second-in-command in the Channel, commander-in-chief at Newfoundland, and port-admiral at Plymouth. In this last position he died in 1817, being at the time an admiral, a baronet, and a K.B. He was probably a brave and capable, but he was certainly a very unpopular officer, and it is to this latter fact that may be attributed the comparative smallness of the rewards which were given for his undoubtedly great services.

Ductility is a property of matter well illustrated by silver, copper, and other metals, which enables it to be drawn out into widely different forms. Copper-wire may be forced through a hole in a metal plate so as to be diminished in diameter while undergoing an extension of its length. The process may be repeated several times, providing that the metal is occasionally annealed so as to avoid the brittle condition. The power of changing shape without breaking when the material is subjected to percussion is called *malleability*, a property closely allied to ductility and illustrated by the same class of metals. By an ingenious process of wire-drawing a silver cylinder with a platinum core, Wollaston succeeded in obtaining platinum wire of exceeding tenuity; one mile of it only weighed $1\frac{1}{4}$ grains.

Dudley, a parliamentary and municipal town in Worcestershire and Staffordshire, is the capital of the "Black Country." The ruins of the old castle, which is supposed to date from Saxon times, and is mentioned in Domesday Book, connect it, like many other thriving industrial centres, with the feudal past. In 1585 Sir Amyas Paulet described the town as being the poorest he had ever seen. It was not until the middle of the last century that the discovery of coal and iron in close proximity awoke the place to new prosperity, and conferred vast wealth on the owners of the soil, the Wards of Bixley, who were soon admitted to the peerage as Barons and Earls of Dudley, a title to which they had some claim through marriage with the heiress of its original possessors. Dudley is on the Great Western Railway, about 8 miles N.W. of Birmingham, and is a fairly well-built but not attractive town, containing the usual public buildings, institutions, churches, etc., all of them modern. Besides coal-mining and iron-working, the chief manufactures are nails, machinery, chains, fire-irons, tools, and glass. There are also brass foundries, brickfields, tanneries, and breweries. The borough returns one member to Parliament.

Duelling. The practice of duelling is still very prevalent on the Continent, but it is now rare in Britain, a challenge to fight being punishable with fine or imprisonment, or both; and it has been long since decided that no words of provocation, however aggravating, can justify it. Duelling had its origin in the trial by battle which was common in early times, jointly with the single combat or tournament of the age of chivalry, which itself owed its existence to the early trial by battle. This was regarded, according to the superstitious notions of the time, as a certain means of ascertaining and determining the guilt or innocence of a person charged with a crime, or of adjudicating a disputed right. It was thought that the Almighty took care to see that in every case justice was done and innocence vindicated. The trial by battle was introduced into England by William the Conqueror, and established in three cases, viz.:—(1) In the court-martial or court of chivalry; (2) in appeals of felony; (3) in civil cases upon issue joined in a writ of right. Once established as a mode of trial, the duel was retained after the superstition which had given rise to it had passed away, and was resorted to for the purpose of wreaking vengeance or gaining reputation by the display of courage. Then came the age of chivalry with its worship of punctilio and personal prowess, its tilts and tournaments; and the duel, originally a mode of trial established by law, became a practice dependent on fashion or conventional notions of honour. The trial by battle in appeals of felony and writs of right was only abolished in the year 1819. The law of England makes no distinction whatever between the killing of a man in a duel and other kinds of murder, and the seconds of both parties are also guilty of murder. Further, where no mischief actually ensues from the meeting it may amount to felony as an attempt to murder. By regulations promulgated in the year 1814, duelling in the army is prohibited under severe penalties. In France attempts were made to check it by legislation in 1892.

Duff, Rev. Alexander, born at Pitlochrie in 1806, and educated at St. Andrew's, where he came under the influence of Dr. Chalmers, took an early interest in missionary enterprise, and in 1829 sailed for India as the first pioneer sent by the Established Church of Scotland into that field. He perceived that education must necessarily precede conversion in the case of a race like the Hindus, and his efforts were largely directed towards the establishment of schools and colleges, with which his name will always be associated. In 1843 he joined the Free Church, pursuing under its banner the same policy. In 1851 during a holiday at home he was elected Moderator, and his views were freely incorporated into the Education Despatch of 1854. His health broke down in 1863, when he accepted a professorship in the Free Church College, Edinburgh, dying in 1878. Besides several valuable works on educational and missionary subjects, he published an interesting book on *The Indian Rebellion: its Causes and Results*, and was for some years editor of the *Calcutta Review*.

Duff, James Cunningham Grant, an eminent Indian soldier and statesman, was born at Banff in 1789, being the son of Mr. John Grant of Kincardine O'Neill. He assumed the name of Duff from his mother, who inherited the property of an uncle, Mr. Duff of Eden. He joined the Bombay army at the age of 16, and after winning military distinction, especially at the siege of Maliah, became Mountstuart Elphinstone's right-hand man in the subjugation of the Mahratta chiefs. The discharge of this duty led him to Sattara, the centre of the confederacy, where he was the first British resident, and he succeeded in establishing satisfactory relations between the warlike tribes and the East India Company's Government. His health broke down under the strain of anxious work, and, returning to his native country, he died at Eden in 1858. His son, the Right Hon. Sir Mountstuart Elphinstone Grant Duff, born in 1829, after a long parliamentary career, became Under-Secretary of State for India in 1868, and for the Colonies in 1880. He went out next year as Governor of Madras, and resigned in 1886.

Dufferin, The Right Hon. Frederick Temple Hamilton-Blackwood, K.P., G.C.B., G.C.S.I., G.C.M.G., G.C.I.E., Marquis of Dufferin and Earl of Ava, only son of the fourth Irish Baron Dufferin, was born in 1826, and educated at Eton and Christchurch, Oxford, succeeding to his father's title in 1841. On his mother's side he was descended from the famous wit and politician, Richard Brinsley Sheridan. In 1846–7 he visited the famine-stricken districts of Ireland, and wrote a valuable account of all he saw. For some years he was a lord-in-waiting, but in 1855 began his diplomatic career by accompanying Lord John Russell in his mission to Vienna. In 1864 he became Under-Secretary for India, being transferred to the War Office in 1866. On the accession of Mr. Gladstone to power in 1868 he joined the administration as Chancellor of the Duchy of Lancaster and Paymaster-General, resigning those posts in 1874 to go out as Governor-General to Canada, the duties of which office he fulfilled up to 1878. He had only been at home a few months when he was appointed to the embassy at St. Petersburg, where he remained only two years, succeeding Sir H. A. Layard at Constantinople in 1881. Before the end of 1884 he proceeded to Calcutta as Governor-General of India. The annexation of Burmah was more or less successfully accomplished under his auspices, and the exploit received its reward and commemoration in the addition of "Ava" to the title of the marquisate conferred upon him in 1888. On leaving India he took over the embassy at Rome, until the death of Lord Lytton in 1892 gave him the still more important post of British representative at Paris. His amusing *Letters from High Latitudes* (1859) are well known. He was recently made Lord Warden of the Cinque Ports. Lord Dufferin married, in 1862, the eldest daughter of Captain Archibald Rowan Hamilton, and has a numerous family. To Lady Dufferin is due in no slight degree the social distinction that has marked her husband's career, and her exertions on behalf of the women of India entitle her to high commendation.

Duffy, The Hon. Sir Charles Gavan, K.C.M.G., was born in co. Monaghan, Ireland, in 1816. At the age of twenty he became sub-editor of the *Dublin Morning Register*, and in 1842, in conjunction with the Young Ireland party, helped to found the *Nation*, contributing to it his well-known articles on "The Ballad Poetry of Ireland." In 1844 he was convicted with O'Connell of sedition, but the conviction was quashed on appeal. Three years later O'Connell seceded from the movement, and Duffy, attaching himself to Smith O'Brien, took an active part in forming the Irish Confederation. In 1848 he was tried for treason-felony, and acquitted, and in 1852 won the seat of New Ross against Sir Thomas Redington, the Under-Secretary for Ireland. The comparative failure of the Tenant League and the Independent Irish party inspired him with disgust for parliamentary life. He resigned in 1856, emigrated to Australia, and resumed his profession as a barrister at Melbourne. He soon plunged into Colonial politics, entered the Victorian Legislature, and became Minister of Public Works in 1857, and of Lands in 1858 and 1862, devoting his abilities to the work of federalising the Australian Colonies. In 1871, after two years' holiday in Europe, he held the Premiership for a few months, but resigned the next year, having succeeded, however, in bringing about a conference of all the Australian governments, which resulted in obtaining large concessions from the mother country. He was knighted in 1873, again passed some years at home, and returned in 1876 to accept the Speakership of the Legislative Assembly, when the distinction of K.C.M.G. was bestowed upon him. In 1880 he returned to England, and published an interesting record of his early experiences under the title of *Young Ireland*, which was followed up in 1883 by *Four Years of Irish History*. Many articles from his pen have appeared in the leading reviews.

Dufla. [Dafla.]

Dugdale, Sir William, the descendant of an old Lancashire family, was born at Shustoke, near Coleshill, Warwickshire, in 1605. Marrying at the early age of seventeen, and succeeding to his paternal estates in 1624, he settled down as a country squire at Blyth Hall, devoting himself to those antiquarian studies that had attracted him from his boyhood. He was collecting materials for a history of Warwickshire when a visit to London brought him into contact with Sir Henry Spelman, the Earl Marshal, Lord Arundel, and Sir Christopher Hatton. He received a post in the Herald's Office, and began to lay the foundations of his great work *Monasticon Anglicanum*, making careful drawings, too, of the chief churches in England, the existence of which was threatened by Puritan zeal. In 1641 he joined Charles I. at Oxford, and spent his next four years in a curious alternation between military duties and archæological research. After the surrender of Oxford he resumed his task in London, with Dodsworth's help, and begun the publication of the *Monasticon* in 1655. At the Restoration he was appointed Norroy King-at-Arms, and in 1677 succeeded to the more important office connected with the Order of the Garter. He died at his Warwickshire home in 1686. We owe to him a *History of St. Paul's*, a *Baronage of England*, and other minor works, besides his autobiography and the great monument of industry with which his name is associated.

Dugong, any species of the Sirenian genus Halicore. The head is rounded and joined to the fish-like body by a short neck, and the snout is bent downwards; the digits of the anterior and only pair of limbs are nailless, and the tail is broad and deeply notched. The upper jaw bears two tusk-like incisors, which persist in the male and point downwards and forwards, but remain in the alveolar cavities in the female; canine teeth are absent, and there are five or six molars in each jaw. According to Prof. Flower, the size of these animals is greatly exaggerated, a length of eight feet being rarely exceeded. These primitive marine mammals frequent the bottoms of shallow bays and creeks feeding on marine vegetation. The female is an excellent mother, and produces a single calf at a birth. The way in which the young are suckled, by holding them to the teats, almost in human fashion, possibly gave rise to the mermaid myth which is commemorated in the generic name (= sea-maiden). There are three species, *H. tabernaculi*, which owes its specific name to Rüppell's fancy that it furnished the "badger" skins for the covering of the tabernacle (Exod. xxv. 5); *H. dugong*, from the Indian and Pacific Oceans, and *H. australis* from the Australian coasts. This last species yields an oil said to possess the medicinal qualities of cod-liver oil without its disagreeable taste and smell. [Manatee, Rhytina, Sirenia.]

Duguay Trouin, René, the most celebrated of French privateers, was born at St. Malo in 1673, and after leading a very irregular life, embarked in 1689 in a privateer frigate belonging to some of his relatives. In 1691 he was given a ship of his own, and almost immediately landed on the coast of Clare and burnt a couple of vessels. In 1692 he obtained a commission from the ex-king of England, James II., and at once became very successful. He afterwards commanded several French men-of-war that had been lent by Louis to be used as privateers, and in the *Diligente*, 36, he was captured in 1694 by an English squadron. But he speedily broke away from Plymouth, where he was detained, and resumed his cruises, this time at the head of a squadron of privateers. He made some handsome prizes, and fought several most creditable actions with men-of-war and Indiamen. These exploits brought him into favour with the king. He gained further successes against the Dutch, and was in 1697 adopted into the French royal navy with the rank of frigate-captain. Upon the resumption of war in 1702 he continued his brilliant services, was ennobled in 1709, and was raised to flag rank in 1715. In 1726 he was made lieutenant-general (vice-admiral), and in 1736, older in honours than in years, he died.

Duisburg, a walled town in Westphalia, N. Germany, situated on a canal connected with the

Rhine, about 15 miles N. of Düsseldorf. Its population is engaged in ship-building and the manufacture of silk, woollen, and cotton fabrics, as well as soap, leather, starch, and tobacco. It possesses an observatory and gymnasium, but the university was abolished in 1802 after an existence of 150 years.

Duke (Latin *dux*, a leader or general). The Roman Emperor Constantine divided the military and civil functions of provincial governors the better to keep them in subjection, and appointed commanders-in-chief (*magistri*, masters) of cavalry and infantry, under whom were district commanders (*duces*), some of whom had the title of *comites* (counts). The German tribes used the term to translate their own word *heretoga* (Germ. *Herzog*), leader of the army. The Franks (q.v.) divided Gaul into districts, whose commanders were *duces* or *comites*, several of the latter being sometimes grouped under one of the former. Charles the Great redivided his empire similarly. After his death, however, the office became hereditary, and was formally recognised as such in 877. The Exarchs of Ravenna, too, appointed dukes over the cities of North Italy. The rank has existed in every nobility of Europe. It was not introduced into England till 1337, when Edward III. created his son, the Black Prince, Duke of Cornwall. It need hardly be said that with the growth of great centralised monarchies the rank, which originally was official, became disconnected from any special duties (save those of a peer) in England and France, and that the duke need have little or no connection with the place whence he takes his title. In both countries it is the highest rank of the nobility. For a time in the reign of Elizabeth it was in abeyance in England. Princes of the blood are often created dukes with us. Other dukes, as also duchesses, are addressed as "Your Grace" and styled "Most Noble." Their eldest sons, by courtesy, rank as Marquises, and bear their father's second title. Their other sons are "Lords" by courtesy, and their daughters "Ladies" (*e.g.* Lord Randolph Churchill, Lady Diana Beauclerk). The ducal coronet has eight golden leaves (commonly called "strawberry leaves") arranged in a wreath on a circlet of gold, which contains a crimson velvet cap, with gold tassel, and lined with ermine. Dukes in the Scottish and Irish peerage, of course, do not sit in the House of Lords as such, but in right of English (usually inferior) titles. In France, before the Revolution, some dukes were peers of France, some were dukes by letters patent (of these dignities there were two kinds), and some dukes for life only, while the three first were hereditary. Abolished at the Revolution, the title was revived by Napoleon I., and dukes were created under the restored Bourbon and Orleanist monarchies and the Third Empire. Of course, the rank is now merely titular. In Germany, as formerly in Italy, the title of Duke or Grand Duke is borne by the sovereign or semi-sovereign potentates. Austrian Archdukes and Russian Grand Dukes are members of the reigning families. The title of duke is similarly restricted in Sweden and Denmark.

Dukinfield, a township in Cheshire, about $1\frac{1}{2}$ mile S. of Stalybridge, and on the Manchester and Stalybridge Railway. Cotton-spinning and coal-mining give employment to a large and scattered population.

Dulce Domum, the Latin school song of Winchester College, sung on the last six Saturdays of the summer half by the school before the traditional "walk to Hills" (St. Catherine's Hill, near the town). The legend is that some three centuries ago a friendless scholar was left in College alone during the holidays. Unable to bear the solitude, he carved the words "Dulce Domum" on a tree, and died of a broken heart. The song has been often translated. It need hardly be said that *dulce domum* does not mean "sweet home."

Dulcigno (classic *Olcinium*; Turk. *Olgun*), a seaport on the Adriatic, about 18 miles S.W. of Scutari. It formerly belonged to Turkey, but was transferred to Montenegro by the Berlin Treaty of 1878. Built on a promontory and defended by a castle, it was for many years a stronghold of pirates, but the inhabitants are now engaged in the coasting-trade or agriculture.

Dulcimer, a four-sided stringed instrument with a sounding board, played by striking the strings with small hammers. It is the prototype of the pianoforte, but owing to the absence of any contrivance for checking the vibrations of one note before another is sounded ("damping"), the effect is somewhat blurred. It is probably of Oriental origin, and is now used only by the Hungarian gipsies.

Dulcite, or DULCITOL, is a crystalline substance which is obtained from an unknown Madagascar root, and occurs in a few other plants. It has the composition $C_6H_8(OH)_6$, being a hexahydric alcohol isomeric with mannite. It forms monoclinic crystals slightly soluble in water, and possesses a sweet taste. It may also be artificially prepared by the action of sodium upon milk, sugar, and galactose, to which substances it is closely related chemically.

Dulong and Petit's Law, in chemical *Physics*, was discovered by these experimenters in 1819. The law states that for most elements the specific heat multiplied by the atomic weight gives a constant number. This number is about 6·2 as the following table shows, the differences actually obtained being readily accounted for by experimental errors. The constant is known as the *atomic heat* of simple substances.

Element.	Specific Heat.	Atomic Weight.	Atomic Heat.
Zinc - - -	·0955	65	6·2075
Iron - - -	·1138	56	6·3728
Tin - - -	·0562	118	6·6316
Copper - - -	·0951	63·5	6·0389
Lead - - -	·0314	207	6·4998
Silver - - -	·0570	108	6·1560
Gold - - -	·0324	196	6·3504

Neumann and Regnault found that all compound bodies of similar atomic composition follow the

same sort of law, though the actual constant varies in different types of compounds.

Dulse, a name applied to several edible sea-weeds. In Scotland it is *Rhodymenia palmata*, known to the Icelanders as the "sugar fucus." *Laurencia pinnatifida* affords an inferior kind known as Pepper Dulse. In the south-west of England dulse is *Iridæa edulis*. These plants all belong to the Florideæ or red sea-weeds.

Duluth, a port on Lake Superior, North America, in the state of Minnesota, U.S.A. It derives its name from a French explorer, and has rapidly risen of late years, being the point of junction between the Northern Pacific Railway and the Mississippi line that connects the town with St. Paul, distant 150 miles to the S.W. Duluth stands on the sloping shore of the lake, from which it is approached by a broad ship-canal. There are docks, warehouses, and manufactories, and a large trade is done in corn, timber, and other western products.

Dulwich, once a hamlet in the parish of Camberwell, Surrey, 4½ miles from St. Paul's Cathedral, has now grown into one of the most thriving and populous of southern suburbs. The manor in 1606 passed into the hands of a tragic actor, Edward Alleyn (q.v.), who founded there the famous College of God's Gift on the lines of St. Paul's school and Westminster. For nearly two centuries his charitable intentions were frustrated; but in 1858 the public conscience awakened, and the foundation was restored by Act of Parliament. The institution, which comprises an Upper and a Lower School, is now most flourishing. The Picture Gallery attached to it derived its origin in the bequest of Sir Francis Bourgeois, R.A., in 1811. Therein are exhibited some of the grandest masterpieces of Murillo, as well as notable examples of the chief Italian and Flemish schools. The district being hilly, picturesque, and salubrious, is covered with villas and humbler residences, and for ecclesiastical purposes is divided into East and South Dulwich.

Dumas, ALEXANDRE, the Elder, was the son of General Dumas, a Creole, sprung from the union of the Marquis de la Pailleterie with a black woman of St. Domingo. Born in 1802 at Villars-Cotterets, his physical and moral nature showed strong traces of his grandmother's blood, though his own mother was of French race and exercised a very salutary influence upon his character. Having lost his father at the age of four, he seems to have led a rather desultory life until 1823, when poverty compelled him to seek his fortune in Paris. A small place in the Duke of Orleans' household enabled him to keep body and soul together whilst he turned his ambitious energies towards dramatic literature. After producing one or two lighter pieces, he resolved, under the influence of a mere casual glimpse of Shakespeare's genius, to introduce naturalism upon the French stage. His *Henry III.*, the starting-point of the Romantic school, proved a decided success in 1829, but the Revolution, into which Dumas plunged recklessly as an opponent of the monarchy, caused its withdrawal. *Antony* in 1831 added to his reputation, though grossly immoral, and *La Tour de Nesle* in 1832, a brilliant plagiarism, enjoyed a long run. Down to 1860, when *La Dame de Monsoreau* appeared, he constantly recurred to the historical drama, in which his best faculties are displayed, *La Reine Margot*, *Mlle. de Belleisle*, *La Jeunesse de Louis XIV.*, and *Le Mariage sous Louis XV.* being the chief of his sixty pieces. In 1832 the *Révue de Deux Mondes* began to publish some of his romances, in which he had for model the works of Scott, then beginning to find appreciation in France, and a temporary expatriation led him to compile his *Impressions de Voyage* and other books on travel, most of the matter being appropriated from previous writers, though the treatment of it is original enough. Indeed, this remark holds good of nearly all his literary productions. The climax of his fame was reached on the publication of *Monte Cristo* in 1844, followed next year by *Les Trois Mousquetaires*. This was the period of his most extraordinary fecundity, when about forty volumes a year was his regular output. It was, of course, physically impossible that he should write or even dictate this prodigious mass of stuff. He employed a number of journeymen, to whom he gave his instructions as regards plot and treatment, correcting their productions before going to press. The chief of this staff was Maquet, who was said to have been the real author of the best of the stories; but what he published under his own name will not bear comparison with the work that bears the signature of Dumas. In 1842 he contracted an unhappy marriage with an actress, Ida Ferrier, and they began together a career of extravagance, which was continued after they parted, as they soon did. Dumas was now in receipt of an enormous income, which he spent in a reckless fashion, building a theatre for himself and a palatial villa, besides indulging every whim of the hour. He accompanied the Duc de Montpensier to Spain in 1846, and indulged in a trip to Algeria and Tunis at the expense of the Government. The Revolution of 1848 saw the beginning of his decline, though he contrived to spend money for twenty years longer. In 1860 he joined Garibaldi, and almost succeeded in bringing Italian patriotism into ridicule. From this time forth he led a hand-to-mouth existence, engaging in any scheme that might furnish him with money to squander, and degrading his old age by his connection with Adah Menken. Ill-health, poverty, and decay of intellect marked his closing years. In 1870, at the outbreak of the war, he was taken to Puys, near Dieppe, where he lingered until the end of the year under the assiduous care of his son and daughter. His remains were transferred in 1872 to Villars-Cotterets, his native town. Braggart, plagiarist, and epicurean as he was, it is impossible to feel unkindly towards him, or to forget that his talents did much towards breaking down the absurd conventionality that had since the epoch of Louis XIV. impeded the development of French literature.

Dumas, ALEXANDRE, the Younger, son of the foregoing, was born in Paris in 1824. He received

a good education, accompanied his father to the Mediterranean in 1846, and made his *début* as a novelist with *La Dame aux Camélias* in 1848. This rather morbid product of sentimentalism was clever enough to establish at once its author's reputation; but it hardly gave an idea of his true character, which in every respect offers a strange antithesis to that of his father. *Le Demi-Monde* (1855), *La Question d'Argent* (1857), *Les Idées de Madame Aubray* (1867), *La Visite de Noces*, *La Princesse Georges* (1871), *Monsieur Alphonse* (1873), *L'Étrangère* (1876), and *Les Danicheff* (1876) are among his most successful dramas. After the war of 1870 and the Commune, he wrote several powerful letters to the press on the social aspects of French politics, and his ethical theories have found expression in the prefaces to his published plays and in *La Lettre d'un Provincial*. Of his novels, which are far less powerful than his dramatic productions, *Le Roman d'une Femme* (1848), *Antonine* (1849), *Diane de Lys* (1851), *La Dame aux Perles* (1854), *L'Affaire Clemenceau* (1867), *Les Femmes qui meut et les Femmes qui volent* (1880), *La Princesse de Bagdad* (1881), and *Faucillon* (1887), have been the most successful. M. Dumas received the Legion of Honour in 1867, and was admitted to the Academy in 1875.

Du Maurier, George Louis Palmella Busson, whose French grandparents settled in England during the Reign of Terror, was born in Paris in 1834. In 1851 he came over to England, and for a time studied chemistry at University College, London, but soon returned to Paris with a view to making art his profession. After some years in the *atelier* of M. Gleyre, and in the schools of Antwerp and Düsseldorf, he started as a designer of wood engravings in London, working first for *Once a Week*, then for the *Cornhill Magazine*, and finally joining the staff of *Punch*, of which he is still a member. He illustrated, moreover, Thackeray's *Esmond*, and *Ballads*, Jerrold's *Story of a Feather*, Foxe's *Book of Martyrs*, and Mrs. Gaskell's *Wives and Daughters*. It is, however, through his clever and genial sketches, ridiculing the foibles and phases of English society, that he is best known, and his talent has filled the gaps left by the premature death of John Leech, whom he surpasses in truth and delicacy, though he does not possess the same versatility and vigorous sense of humour. A series of his *Punch* drawings was published in 1880, and many of them were exhibited in 1885. Mr. Du Maurier is a member of the Old Water Colour Society. Of late he has suffered from an affection of the eyes, which has seriously interfered with ease and rapidity of production.

Dumbarton, the capital of Dumbartonshire, is a royal, parliamentary, and municipal borough and port situated at the junction of the rivers Clyde and Leven, 14 miles N.W. of Glasgow. The Romans had a naval station here known as Theodosia, which, under the name Alclnyd, became the capital of the British kingdom of Strathclyde. Later on the town passed into the hands of the Earls of Lennox, who transferred it to Alexander II., when it was erected (1221) into a royal burgh, with the privilege of levying certain tolls on the Clyde navigation. This right was maintained until 1700. The town occupies a semicircular site along the east bank of the Leven, which forms a commodious harbour, and a handsome stone bridge connects it with a suburb on the opposite shore. The basaltic rock of Dumbarton, shooting up to a height of over 200 ft., and crowned by a strong castle, commands the port. Since the decay of the glass factories, iron-shipbuilding has become the chief industry, and engages thousands of hands, the Dennystown Forge Company being the principal employer of labour. In conjunction with Kilmarnock, Renfrew, Rutherglen, and Port Glasgow, the borough returns one member to Parliament.

Dumbartonshire, anciently Lennox or Levenaux, is in the W. of Scotland, between the Clyde Estuary S., Perthshire N., Stirlingshire and Lanarkshire E., Loch Long and Argyllshire W. It is cut in two by a part of Lanarkshire, the north portion being twice as large as the other. The total area is 154,542 acres, of which the lower districts along the Clyde and Leven are remarkably fertile whilst the upper tracts to the north contain Ben Voirlich, Ben Vane, and some of the finest scenery in Scotland, besides yielding building stone, slate, iron ore, and coal. Large numbers of cattle and sheep are pastured on the hills. The coast line extends for 35 miles on the west side, and Loch Lomond stretches for 20 miles to the east, so that the county has always enjoyed facilities for water-carriage. These were augmented in 1775 by the opening of the Forth and Clyde Canal, and since 1850 several railways have been constructed. Calico-printing, bleaching, and dyeing, are carried on in the valley of the Leven, and factories for spinning and weaving exist at Duntocker, Milton, and elsewhere. Among the chief towns and villages are Datmuir, Renton, Bonhill, Cardross, and Kirkintilloch, the port of Bowling, and the watering-places of Helensburgh, Kilcreggan, and Roseneath. Rob Roy's country lies in the north, and legends of Wallace and Bruce abound in other quarters.

Dumbness. This condition may exist in connection with deafness developing in infancy [Deaf and Dumb], or may be due to disease of the brain [Aphasia]. It is sometimes met with in lunatics, and is of not unfrequent occurrence in hysterical conditions. In the last-named condition the infirmity is only transitory as a rule, and is usually amenable to treatment.

Dumfries, the capital of Dumfriesshire, a royal, parliamentary, and municipal borough and river port, stands on the left bank of the Nith, eight miles from the Solway Firth, and 33 miles N.W. of Carlisle. The date of its origin is uncertain. It was made a royal burgh by William the Lion, took a strong part on Balliol's side in the wars of the early 14th century, was for two and a half centuries mixed up in the frequent border forays, having a close union first with the Douglases and then with the Maxwells of Caerlaverock. It was opposed to the Union, but loyal to the Hanoverians, for which

reason the Young Pretender exacted a requisition in 1745. No Scottish town has made more rapid progress during the last fifty years. Always possessed of a good market as the centre of a rich agricultural and pastoral district, it has of late taken a prominent part in the tweed and hosiery trades, in the growth and sale of nursery produce and timber, in leather-making, and in the working of iron. The chief interest in the place outside the commercial sphere is due to its connection with Burns, who lies buried in the churchyard of St. Michael's. The stone bridge built by Devorgilla, mother of John Balliol (1280), is a remarkable structure. The town has also schools, hospitals, lunatic asylums, and other public institutions. With Annan, Kircudbright, Sanquhar, and Lochmaben, it returns one member to Parliament.

Dumfriesshire, one of the Scottish border counties, is bounded on the S. by Cumberland and the Solway Firth, on the N. by Lanark, Peebles and Selkirk, on the E. by Roxburgh, and on the W. by Ayr and Kirkcudbright. It has a length of 50 miles by a breadth of 32 miles, with an area of 1,103 square miles. The whole county sweeps down with an irregular slope from the mountainous northern boundary to the Solway Firth, on which it has a coast-line of 21 miles. The valleys of the Nith, the Annan, and the Esk form three natural divisions, each of from 40 to 50 miles in length, and of increasing fertility as the lower levels are reached. Farming is carried to a high pitch of perfection, and sheep-breeding, cattle-dealing, and pork-curing add to the resources of the district, which can only boast of rich coal mines and lead mines in the N.W., quarries of lime and sandstone, even alluvial gold, some woollen factories, and excellent salmon-fishing. Sanquhar, Lochmaben, Lockerbie, Langholm, Annan, and the Spa of Moffat are the places of chief importance; whilst Ecclefechan is famed as the birthplace of Carlyle, and Gretna Green, on the Cumberland border, was the scene of runaway marriages till 1856. As the home of many great border families, Dumfriesshire is dotted over with numberless ruined castles. The Caledonian main line traverses the northern half of the county, and the Glasgow and South Western line passes through Dumfries and the southern portion.

Dumont, Pierre Étienne Louis, was born at Geneva in 1759, and being early left fatherless had to work even as a schoolboy for his own support and that of the family. In 1781 he was chosen one of the pastors of the city, but political troubles drove him into exile, and after a short stay in St. Petersburg he came to London as private tutor to Lord Shelburne's children. Here he soon allied himself with the advanced Whigs, and acted as French editor, so to speak, to Bentham for many years. He visited Paris in 1788 and 1789, making the intimate acquaintance of Mirabeau, whom he helped in the management of his paper, *Le Courier de Province*. Returning to England, he lived at Lansdowne House or Bowood, and was a frequent guest at Holland House, thus meeting all the most eminent thinkers and writers of Europe. In 1814 he resumed his residence in his native city, where he soon became the leader of the Supreme Council, devoting himself especially to legal reforms. He died in 1829 at Milan, whilst on a holiday excursion. His *Souvenirs sur Mirabeau* appeared in 1832.

Dumont d'Urville, Jules Sébastien César, was born at Condé-sur-Noireau, in Normandy, in 1790, and at the age of seventeen went to sea as a probationer in the French navy. He soon made his way in this career, and used his leisure to such purpose as to become master of several sciences and languages. In 1820, whilst surveying the Mediterranean, he discovered the Venus of Milo. In 1822 he served under Duperrey, and three years later, as captain of the *Astrobale*, he sailed in search of La Pérouse, returning with valuable geographical information as to the southern hemisphere. His famous voyage in the South Polar Sea was begun in 1837; it resulted in the discovery of Joinville Island, Louis Philippe Land, Adélie Land, and in more exact knowledge of the Pacific groups and the Eastern Archipelago. He had scarcely been a year at home when he was killed (1842), with his wife and son, in a railway accident near Versailles. His works include descriptions of his voyages, a summary of Magellan's travels, and an account of the flora of the Greek islands and the Black Sea.

Dumouriez, Charles François, was born of a good Provençal family in 1739, and when eighteen accompanied his father, a commissary of the army that invaded Hanover during the Seven Years' war. He distinguished himself, and won a captaincy, but on the reduction of the strength had to retire, when he was employed in secret, having a decided bent for diplomacy. In Corsica, Poland, Sweden, and elsewhere, he was engaged in intrigues not only for the French Government, but on his own account, and as a consequence passed the last years of Louis XIV.'s reign in prison. On his release he pointed out the value of Cherbourg as a harbour, and in 1778 was made governor there. An advocate of reform without abrogation of the monarchy, he was looked upon with high favour by the Girondists in 1788; and having for a brief period acted as a Minister for Foreign Affairs and for War, he was sent under Marshal Luckner to command the Army of the North. His success over the Allies at Valmy (1792) was followed up by a brilliant campaign in the Austrian Netherlands. Early in 1793 he was defeated by Coburg at Neerwinden, and being accused of treachery by the agents of the Convention, from whom the execution of the king had alienated him, he went over to the Austrian camp. After many wanderings he settled in England in 1804, and enjoyed a pension from Government. At the Restoration he was slighted by the Bourbons, nor did he ever return to France, dying at his own house near Henley-on-Thames in 1823.

Dünaberg is a town in the government of Vitebsk, European Russia, built on both sides of the river Dwina, 12 miles S.E. of Riga. It possesses a first-class fortress, commanding a floating-bridge over the river, and from its position on the railway between Warsaw and St. Petersburg is of great

military and commercial importance. There is a large trade in hemp, flax, tallow, and timber, and the local industries include tanning, brewing, brick-making, etc. The town was founded originally by one of the orders of Teutonic knighthood in 1278. It was acquired by Poland in 1559, but was soon after taken by Ivan the Terrible. The Swedes held it for a short time in the 17th century, and the French under Macdonald captured it in 1812.

Dunbar, a royal, parliamentary, and municipal burgh and port, in the county of Haddington, Scotland, occupies an elevated site on the mouth of the Firth of Forth, about 29 miles N.E. of Edinburgh, with which city it is connected by the North British Railway. The castle, now in ruins, was a famous stronghold in the middle of the 9th century, and the town was made a royal burgh by David II. After the defeat of Balliol (1296) it was taken by Edward I., and Edward II. took refuge there in his flight from Bannockburn. Black Agnes of Dunbar, Countess of March, defended the place against Salisbury in 1337, and it often served as a retreat to Mary Queen of Scots. The castle was destroyed by the Regent Murray in 1567. Cromwell routed the Scots at "the race of Dunbar" in 1658. Among other relics of antiquity are the ruins of the Grey Friars convent, and the mansion of the Lauderdales. On the site of the old collegiate church stands the modern parish church, with a lofty tower that serves as a landmark. Herring fishery and shipbuilding are the chief industries, but there are a few foundries, distilleries, and breweries. The harbour, once limited and shallow, and always difficult of access, has been improved of late years. In conjunction with Haddington, Jedburgh, Lauder, and North Berwick, Dunbar returns one member to Parliament.

Dunbar, WILLIAM, was born in Lothian, Scotland, about 1460, being of the family of the Earls of March. In 1477 he graduated at St. Andrew's, and appears to have become a preaching Franciscan. Before the end of the century James IV. employed him on diplomatic missions, and from the year 1500 he was a pensioned servant of the king and "rhymer of Scotland." He visited England on the marriage of his master with Princess Margaret, and he received a present from Henry VII., probably for *The Thrissil and the Rois*, a poem commemorating that event. We have about a hundred of his compositions, most of them short, but showing a good deal of imagination, high descriptive powers, and an exuberant humour that is occasionally unintelligible and not seldom coarse. *The Golden Targe* is a serious allegory of high aim, but wearisome. *The Dance of the Seven Deadly Synnes*, a weird and grotesque performance, has the merit of originality. *The Freiris of Berwyk* and *The Twa Maryit Wemen and the Wedo* follow Chaucer pretty closely, whilst *The Flyting of Dunbar and Kennedy*, being hardly comprehensible, though full of strongly-flavoured expressions, has been very popular in the north. After the battle of Flodden the poet disappears from view, but is supposed to have lived until 1520, or even a few years later.

Dunbird. [POCHARD.]

Duncan, the King of Scotland immortalised in Shakespeare's *Macbeth*, succeeded his grandfather Malcolm II. in 1033. Investigations would seem to indicate that the dramatist's masterpiece, like many other great works, is based on a posthumous libel. Macbeth's father had been killed by Malcolm, as had also the grandfather of Lady Macbeth, whose real name was Gruoch, and their joint claim to the throne was stronger than Duncan's. The struggle was carried on until 1039, when Duncan was defeated and killed at Bothgowan near Elgin. [MACBETH.]

Duncan, ADAM, VISCOUNT, British naval officer, younger son of Alexander Duncan, of Lundie, was born at Dundee in 1731, and entered the royal navy at the age of 12. He took part in the expeditions against Rochefort and Goree, and, having been posted in 1761, was Keppel's flag captain at the reduction of Belleisle and at the operations against Havana. He shared in Rodney's relief of Gibraltar, and, in command of the *Monarch*, distinguished himself in the action with De Langara in 1780. He also shared in Howe's relief of Gibraltar. In 1787 he became a rear-admiral, and in 1793 a vice-admiral. In 1797, after having most bravely quelled a mutiny on board his flagship, the *Venerable*, in Yarmouth Roads, he put to sea with two ships, the only ones of a mutinous fleet that would accompany him, and, in spite of his small force, blockaded the Texel for several months. Being then reinforced, he met the Dutch fleet, which had, during his temporary absence, ventured out, and on October 11, 1797, most crushingly defeated it off Camperdown, capturing eight ships of the line. For this great service he was rewarded with a barony and viscounty, a pension of £3.000 a year, the thanks of both Houses, the freedom of the City and a sword of honour. Lord Duncan, whose character was one of the noblest and most amiable that has adorned the navy, was a man of extraordinary strength and physique, and particularly handsome. He died, universally lamented, on August 4, 1804.

Duncan, THOMAS, born at Kinclaven, Perthshire, in 1807, was destined for the law, but, having a taste for art, became a pupil of Sir William Allan, the eminent Scottish painter. He acted for many years as Professor of Colouring in the Trustees Academy, Edinburgh. His first important picture, *The Young Pretender entering Edinburgh after Prestonpans*, won him the associateship of the Royal Academy in 1843. *Charles Edward sleeping after Culloden* was exhibited in that year, and in the next appeared *Cupid* and *The Martyrdom of John Brown of Priesthill*. He died young in 1845, leaving a number of excellent portraits that testify to his skill.

Dundalk, a port and parliamentary borough in co. Louth, Ireland, situated in Dundalk Bay, at the mouth of the Castletown river, 50 miles N. of Dublin, and on the North of Ireland Railway. It was a royal city in the reign of Edward II. Edward Bruce was proclaimed king there in 1315, and was killed in a battle close by. The place was

taken by the Irish in 1641, by Cromwell in 1649, and by Schomberg in 1689. The parish church has a curious copper-covered steeple of wood, and the Roman Catholic church has some architectural pretensions. There are the usual public buildings of a county and assize town. The chief trade is in agricultural produce, but flax-spinning, iron-founding, distilling, brewing, and salt-making, are also carried on. The harbour has undergone much improvement, and a railway has been constructed to Greenore on Carlingford Lough, so that regular steam traffic is now maintained, and the exports of grain and live stock are considerably increased. Dundalk returned one member to Parliament until 1885, but is now merged in the county.

Dundas, Sir David, was born in Edinburgh, of good Scottish family, about 1735, entered the army in 1752, and in 1759 accompanied Colonel Elliot, afterwards Lord Heathfield, to Germany. Three years later he followed the same officer to the West Indies, obtaining command of a cavalry regiment after twenty years' service. An experience of the Prussian military system under Frederick the Great induced him to write two works on tactics and drill that were for a time adopted in our army. At Toulon (1793), in Holland under the Duke of York (1794), and again in the disastrous expedition of 1799, he fought with distinction. He became successively Quartermaster-General, Governor of Chelsea Hospital, and Commander-in-Chief in succession to the Duke of York (1809). He died in 1820.

Dundas, Henry, Viscount Melville, belonged to the Arniston branch of the same family as the foregoing, and was born about 1740. After an education received at the High School and University of Edinburgh, he entered the profession of the law, of which his father and many other relatives were distinguished members. Such was his ability that in 1775 he had attained the position of Lord Advocate, and was returned to Parliament as member for the county of Edinburgh. He passed over from the Opposition to the Ministry, and was appointed by Lord Shelburne in 1782 treasurer of the navy. This office he resumed under Pitt on the fall of the Coalition, and he remained closely associated with that statesman until 1801, acting for ten years as Home Secretary. At Pitt's return to power in 1804 he became First Lord of the Admiralty, having in the meantime been created Viscount Melville and Baron Dunira in the interregnum of Addington. He was charged in 1805 with being concerned in the application of public money to speculative objects by his agent, Mr. Trotter, and to Pitt's great sorrow he was compelled to resign. A subsequent trial resulted in his acquittal, when he was restored to the Privy Council, but not to office. He died in 1811. His son and successor became First Lord of the Admiralty under Wellington in 1828.

Dundas, The Hon. Sir Richard Saunders, British naval officer, was second son of Viscount Melville, and was born in 1802. He became a commander in 1823 and a captain in 1824, and in the latter capacity served with credit in China in 1841. In 1853 he was made rear-admiral, and in 1855 he commanded the Baltic Fleet against Russia. He died a vice-admiral in 1861. Admiral Sir James Whitley Deans Dundas, who was a son of Dr. James Deans, of Calcutta, and who was born in 1785, assumed the name of Dundas on his marriage in 1808. He was commander-in-chief in the Mediterranean, and, during the early part of the Russian war, in the Black Sea, and he died in 1862. He was not related to the officer above-mentioned.

Dundee. [Claverhouse.]

Dundee, a royal and parliamentary burgh and port in Forfarshire, on the N. shore of the Firth of Tay, and about 12 miles from the German Ocean. It is an ancient town, and is said to have been called Alectum, but the first mention of its existence is in a deed of about 1200 A.D. William the Lion made it a royal burgh, and here Wallace was born and began his struggle for independence. Dundee was twice taken by the English in the reign of Edward I., again in that of Richard II., and a fourth time under Edward VI. Adopting with fervour the principles of the Reformation, it was sacked by Montrose in 1645 and by Monk in 1651, when a sixth of the inhabitants were put to the sword, and an immense amount of plunder was carried away. Though it then ranked as the third town in Scotland for population and higher still for wealth and strength, its great prosperity only dates back a century, when steam-power was first applied to the spinning and weaving of flax, hemp, and jute. Other sources of wealth are whale-fishing, shipbuilding, leather-dressing, boot-making, and confectionery, the factories of Messrs. Keiller and Sons being among the largest in the kingdom for the production of jam and marmalade. The docks cover an area of 35 acres. Most of the antique public buildings have disappeared, but the Old Steeple, restored by Sir G. Scott, Dudhope Castle, now converted into barracks, the old Custom House, and a part of the venerable walls, from which Wishart the martyr preached in 1544, still remain. Among modern structures are the Town House by Adam, the Albert Institute (Gothic), by Sir G. Scott, the High School, by Angus, the Royal Arch, commemorating the visit of the Queen in 1844, the Royal Infirmary (Tudor), the Morgan Hospital, the College and the free library. There is a fine esplanade on the river, and half-a-dozen public parks, of which the chief are named after Baxter and Balgay. The water supply derived from Loch Lintrathen is excellent. The North British and Caledonian Railways formerly approached the town by a circuitous route, but in 1878 the famous Tay Bridge was opened. Next year this costly work was destroyed during a storm, a terrible loss of life ensuing. A more secure viaduct now spans the estuary, and forms one of the noblest monuments of engineering skill.

Dundonald, The Hon. Thomas Cochrane, sometime Lord Cochrane, and afterwards tenth Earl of, a very brave and distinguished naval officer, was born in 1775. He entered the service in a nominal capacity in 1780, but did not actually go to sea until 1793, having previously been gazetted to a captaincy in the 79th Foot. In 1795,

as acting lieutenant of the *Thetis*, 42, he contributed to the capture of two French men-of-war; in 1799 he took part in a very gallant boat action off Gibraltar; and in 1800 he was made acting-captain of the French prize *Généreux*, 74. He was in the same year made commander in the sloop *Speedy*, 14, in which he executed some of the most daring exploits in our naval history. Particularly celebrated is his action with, and capture of, the Spanish frigate *Gamo*, 32, in 1801. The *Speedy* herself was afterwards taken by a French squadron, but Lord Cochrane was speedily exchanged, and posted for his successes. He next distinguished himself in the *Pallas*, 32, and *Impérieuse*, 44. While commanding the latter he led the attack upon the French shipping in Basque Roads on April 11, 1809, and for this most heroic service he was made a K.B. In 1814 certain charges, which were afterwards proved to be utterly false, were preferred against him, and he was deprived of all his professional rank and honours. He thereupon assumed command successively of the insurgent navies of Chili, Brazil, and Greece, behaving everywhere with the highest heroism and resource and gaining special glory by his marvellous capture of the Spanish frigate *Esmeralda*. In 1830 Lord Cochrane was reinstated in his place in the British navy; in 1831 he succeeded to the family peerage; and in 1847 the Order of the Bath was at length restored to him. He had become a vice-admiral in 1841, and became an admiral in 1851. In 1860 he died. His lordship published most interesting accounts of his adventurous and honourable life, and his *Autobiography of a Seaman* should be read by every English-speaking boy.

Dunedin, the capital of the district of Otago in South Island, New Zealand, was founded in 1848 by the Lay Association of the Free Church of Scotland. It stands at the head of the harbour of Otago, on the S.W. shore, about 18 miles from the sea, and Port Chalmers, 9 miles lower down, affords anchorage for the largest vessels, while large sums have been expended in rendering Dunedin itself accessible. Regular steamers run to Melbourne and to all the New Zealand ports, and the coasting trade is very considerable. The city is beautifully placed, well-built, and surrounded by pleasant suburbs. It contains the University of Otago, free libraries, schools, churches of all denominations, a provincial council hall, supreme court, and all the other buildings of an administrative centre. The public gardens are particularly fine. In 1861 the settlement received a great impulse from the discovery of gold, but the prosperity of the colonists, who are mainly Scots, is based upon the enormous development of the wool trade, and upon the growth of the shipping interest.

Dunes, heaps and ridges of sand, or less commonly of finely powdered calcareous matter, piled up by the action of winds. They are chiefly found on windward coasts, but also inland, as in the Sahara, Arabia, Utah, and Arizona. They travel in parallel ridges often of considerable height, such as 50 or 60 feet in Norfolk and in Holland, where, however, they sometimes reach 260 feet high over a belt reaching five miles in breadth. They often dam back streams forming pools, salt-marshes, or extensive swamps, as along the coast of Gascony, and, if not arrested, may travel inland from 3 to 24 feet annually, as on the Danish coast. Owing to the destruction of good land thus brought about, they have been planted with the sand sedge (*Carex arenaria*) with running stems, or better still, as to the south of Bordeaux, with the cluster pine (*Pinus maritima*), which is a valuable source of timber and turpentine, besides binding the sands with its roots and breaking the force of the wind. Dunes, 100 to 200 feet high, occur on the south-east of Lake Michigan, and those east of the Caspian have deflected the Oxus into the Sea of Aral. Long parallel lines of high dunes traverse the deserts of central Australia. In Cornwall, the Bahamas, and Bermudas the fine-grained material is largely the comminuted remains of nullipores (q.v.), a group of algæ encrusted with carbonate of lime, and this substance is often cemented by percolating waters into a compact stone.

Dunfermline, a very ancient city and royal burgh in the W. of Fifeshire, Scotland, 16 miles N.W. of Edinburgh, with which it is connected by two lines of railway, and three miles from the Firth of Forth at Limekilns. Standing 300 feet above the sea, it is cut in two by a deep ravine or "linn," from which it takes its name, "the fort on the crooked linn." It is irregularly built, with narrow and tortuous streets. The ruins still exist of the old palace where the kings of Scotland often resided as early as the 10th century. Charles I. is said to have been born here, Charles II. having been the last royal occupant. Edward I. held court in the Benedictine Abbey, of which portions, built by Malcolm Canmore in the 11th century, are in use at present. The tomb of Bruce lies below the pulpit of the new church, erected on the site of the abbey chancel. The modern public buildings are excellent, and include public baths, the gift of Mr. Andrew Carnegie, a wealthy American citizen and a native of the place. The manufacture of damask and table-linen is the chief industry, but there are collieries, iron-foundries, soap-works, and other undertakings. Together with Stirling, Inverkeithing, and Culross, Dunfermline returns one member to Parliament.

Dunganis (Tungans), a historical people scattered over various parts of Mongolia and the western provinces of China (Kansu, Shensi, Sechuen), and numerous especially in Zungaria. The term Dungân, *i.e.* "Converted," is applied in a general way to all the Chinese Mohammedans (the Shui-Shui, or Hui-Hui of Chinese writers); but it indicates more particularly the mixed Mongolo-Chinese Mohammedans of the western regions, who now form a special type distinguished by large muscular frames, arched nose, oblique eyes, and somewhat fair complexion. They appear to have been originally of Tatar stock, and they themselves claim descent from the Uigur Tatars removed to the vicinity of the Great Wall during the Thang dynasty (7 to 10 centuries of new era). All are now

Mussulmans of Chinese speech, and those of Zungaria rebelled against the Chinese Government in 1864, when they exterminated all the officials, and rapidly occupied the Ili valley and the Tian-Shan region as far as Urumtsi. But in 1867 the Taranchis of Chinese Turkestan, wearied with their exactions, rose against them, killed large numbers, and drove the rest into the territory of Kulja, at that time held by the Russians. Since then most of the Dungânis have returned to Zungaria, where by crossings with the Taranchis and Kirghiz they have developed a type quite distinct from the Chinese. The Dungânis, taking the word in its wider sense, are estimated to number about 30 millions altogether. (Prjewalski, *Mongolia*, vol. ii.; Schuyler, *Turkestan*, vol. ii.; Ch. de Ujfalvy, *Bulletin* of the French Geographical Society, 1878 and 1879.)

Dung Flies, a group of flies that live on dung, on which they feed and in which they bury their eggs, so that the larvæ may at once obtain a supply of suitable food. The best known English species is the "yellow downy dung fly" (*Scatophaga stercoraria*, Linn.).

Dunkirk, or DUNKERQUE, "the church on the dunes or sandbanks," is a fortified port in the department of Nord, France, 43 miles N.W. of Lille. According to tradition, it owes its origin to a chapel founded by St. Eloi in the 7th century, and was raised to the rank of a town by Baldwin III. in 960. The English burned it in 1388, and later on occupied it, being driven out in 1558 by the French, who in turn surrendered it to the Spaniards. In 1646 it was again captured and soon afterwards restored, but in 1658 Turenne wrested it from Spain, and gave it to England. Charles II. sold it for £200,000 to Louis XIV. The Duke of York besieged it in vain in 1793. Dunkirk has a military as well as a commercial harbour, and though the entrance is shallow and difficult there is safe anchorage in the roads. The docks cover 100 acres, and a large import and export trade is done. The Dunkirk boats take a considerable part in the herring and cod fisheries. The growth of beetroots and the manufacture of sugar afford occupation to much of the population, but ship-building, iron-founding, distilling, and the making of soap, starch, and salt are important industries. There are many churches, the chief being that of St. Eloi, rebuilt in 1560. The Beffroi or signal tower, with a fine peal of bells, the modern *Palais de Justice*, the pictures in the Exchange and elsewhere, and the statue of Jean Bart by David d'Angers, deserve to be noticed.

Dunlin (*Tringa alpina*), an active British sandpiper, called also Purre, Stint, Ox-bird, and Sea-snipe, common on shores and about tidal rivers, feeding on small crustaceans, insects, and worms, and retiring inland to breed. The male, which is slightly smaller than its mate, is about eight inches long, but these birds vary greatly in size, coloration, and in the length of the bill. The summer plumage is black above with rusty grey and white markings; throat light grey, a black horseshoe-like mark on the breast, and the rest of the lower surface white. In winter the upper surface is much lighter, and the under surface is white.

Dunmow, GREAT, a market-town in Essex, on the Great-Eastern Railway, 11 miles N.W. of Chelmsford. Its incorporation dates from Philip and Mary. On the opposite or left bank of the river Chelmer stands Little Dunmow, within which was situated a priory, where in the reign of John was started the strange practice of presenting a flitch of bacon to any married couple that could prove they had spent the first year of their union in perfect happiness and concord. A jury of bachelors and spinsters had to decide upon the claim, which was only successfully established five times between 1445 and 1753. Mr. Harrison Ainsworth drew attention to the custom in one of his novels, and it was revived in 1855 at Great Dunmow, being still kept up there by casual enthusiasts. At Whichnor in Staffordshire, St. Meleine in Brittany, Vienna, and elsewhere a similar usage seems to have prevailed.

Dunnock. [HEDGE SPARROW.]

Dunnottar, a town on the coast of Kincardineshire, Scotland, 16 miles S.E. of Aberdeen, and forming part of the seaport of Stonehaven. On a rock that rises abruptly from the sea to a height of 160 feet stands Dunnottar Castle, once the abode of the Keiths, Earls Marischal, alleged to have been founded in the 7th century. During the Commonwealth the Scottish regalia were preserved here, and after the Restoration the stronghold was used for the imprisonment of Covenanters. It was dismantled in 1720. Dunnottar House is situated about a mile inland.

Dunois, JEAN, "the Bastard of Orleans," was born at Paris in 1402, being the natural son of the Duke of Orleans and Mariette d'Enghien, Madame de Cany. Recognised and educated by his father, he early distinguished himself in the war against England, and in 1428–29 joined Joan of Arc in defending Orleans and in the victory of Patay. Seven years later he entered Paris in triumph, having raised the siege of the capital as well as of Chartres and Lagny. He was mainly instrumental in driving the English inch by inch out of the Ile de France and Normandy. He then instigated Louis XI. to rise against his father, but made up for his disloyalty by expelling the English from Guienne and Bordeaux. For these great services he was legitimated by Charles VII., created Grand Chamberlain, and loaded with honours, of which Louis XI. deprived him. He next took part in the league against that monarch, but, playing the part of a mediator in the quarrel, was restored to his former dignity, and died in 1468.

Duns Scotus, JOHN, was born after the middle of the 13th century, but neither the precise date nor even his nationality has been ascertained. He joined the Franciscan order, became a fellow of Merton College, Oxford, and in 1301 was appointed professor of philosophy in that university. His lectures appear to have been immensely popular. At the end of three or four years he proceeded to Paris, where he took a doctor's degree, and became regent of the school of theology in 1307. His contest with the Dominicans and their leader,

Thomas Aquinas, as to the doctrine of the Immaculate Conception, won for him the title of Doctor Subtilis, and led to the long-standing opposition between Scotists and Thomists. Both were realists, but Scotus and his disciples held that all knowledge was based on revelation, whilst Aquinas recognised reason as an intellectual factor. The former maintained both the freedom of the will and the doctrine of predestination, the latter making the will dependent on the understanding and other antecedent causes. Hence a distinction between the two schools as to the theory of divine grace. Duns Scotus was invited to Cologne in 1308 for the purpose of establishing a university, but he died of apoplexy before the close of the year. He left a number of works which have been printed with apocryphal additions. The most valuable of his remains consist of commentaries on Aristotle.

Dunstable, a market-town in Bedfordshire, 33 miles N.W. of London, on the North-Western and Great Northern Railways. Being placed at the point where Watling Street and Icknield Street meet, it was probably a Roman station, but the first historical proof of its existence dates from 1110, when, according to Matthew Paris, the religious play, *St. Katharina*, was acted there. The Augustinian Priory, of which the existing parish church formed part, was founded in 1131, and for centuries a feud raged between the canons and the burghers as to the lordship of the town. The *Annales de Dunstaplia*, extending to 1297, afford a most valuable record of contemporary events. The richly-decorated west front of the parish church, the monuments of the Chew family and Thornhill's *Last Supper* inside the building, and the Ashton schools are the chief objects of interest in the town. Straw-plaiting employs most of the population, in which the female element largely preponderates. A charter of incorporation was granted in 1864.

Dunstan, St., was born at Glastonbury, about 924, of a family reputed to share royal blood. A Bishop of Winchester was his uncle. He displayed in his youth great abilities, and was taken into the household of Athelstan, where his clerkly skill, musical accomplishments, and popularity with the ladies raised up many enemies. Driven from court on suspicion of sorcery, he resolved to take the tonsure, and, being restored to the favour of Edmund, was made, at the age of 22, Abbot of Glastonbury and treasurer to the king. The weakness of Edred strengthened Dunstan's position, so that on Edwy's accession in 955 he attempted to control him as he had his predecessor. The story of the young king's love for Elgiva, daughter of Ethelgiva, and of Dunstan's interference, belongs to the romance of history, nor is it possible to appreciate fairly the points at issue. Ethelgiva ultimately succeeded in driving Dunstan to seek refuge at Ghent, but he soon returned to assist Edgar in wresting the kingdom from his brother and in effecting the pacification of Northumbria, for which he was rewarded with the Archbishopric of Canterbury. He placed the crown on Edward's head, though it is alleged that he got rid of the opposition in the Witan by a mechanical miracle, which caused half of the floor of their meeting-place at Calne to collapse during the debate. His influence appears to have diminished under Ethelred the Unready, and he is reported to have withdrawn from public business to spend his last years in prayer, music, and the making of bells and other tuneful instruments. He died in 988 It is not easy to separate the false from the true in the legendary accounts that have come down to us. His personal conflicts with the Devil, whose nose he pulled with red-hot pincers, are recorded with as much gravity as his more statesmanlike exploits. He appears to have been a broad-minded ecclesiastic, whose influence on his age was decidedly beneficial, and whose death was certainly followed by national disaster. It is extremely doubtful whether any of the works assigned to him are authentic.

Duodecimals, in arithmetic, an old system for the determination of areas and volumes of rectangles and rectangular prisms respectively, when their linear dimensions are given in feet and inches.

Dupanloup, Felix Antoine Philibert (1802–1878), a French prelate born at St. Félix, near Chambery, in Savoy. He was brought up by his uncle, a country priest, and went when quite young to Paris. In 1821 he entered the seminary of Issy, and was ordained in 1824. Having been appointed vicar of the Madeleine, he made a great impression by his eloquence, and his further nomination as confessor of the little Duke of Bordeaux, and later of Talleyrand, brought him more into notice. His style of preaching has been described as "limpid as a blue sky," but "brilliant and cold." He was a member of the Sorbonne in 1841, and shortly afterwards he went to Rome, where he was fêted and made much of. On his return to France he came forward as the champion of Catholicism, and was the moving spirit of the paper *Ami de la Religion*, which acted as the counterpoise to the erratic *Univers*. He was made Bishop of Orleans and member of the Educational Commission, and distinguished himself by vigorous opposition to the campaign that was being fought against the classics as part of the regular course of education. In 1854 he was elected an Academician. He was a great champion of the Pope's temporal power, but was opposed to the dogma of Infallibility, though of course, when it was declared, he acquiesced in it. During the Franco-Prussian war he displayed great patriotic feeling, and in 1871 he became deputy for Orleans. He was devoted to the poor, and an enthusiast in education.

Dupleix, Joseph François, Marquis (1697–1764), a French statesman and famous governor of the French East Indies, was born in Hainault, of which province his father was farmer-general. At the age of 18 he went to sea, and made voyages to America and India, where he remained. In 1720, by means of the influence he was able to command, he was war-commissary and member of the Superior

Council of the French colony. As governor-general he encouraged trade and developed Chandernagore, besides getting a footing in Patna. In his projects he was greatly aided by his wife, who was skilled in Oriental languages and customs, and together they succeeded in establishing a preponderating French influence throughout the Carnatic. When in 1746 war broke out with the English East India Company, Dupleix and La Bourdonnais would perhaps have crushed the Company could they have agreed together. Dupleix fortified Pondicherry, and defended it when besieged. After the peace he was recalled—to please England, it is said—and the Government refused to make good the private fortune he had expended in defending their possessions. Had Dupleix had his hands free it is possible that he might have made India a French empire.

Duplicate Ratio, of two numbers, means the ratio of their squares. Thus the duplicate ratio of the numbers 5 and 6 is not 5 : 6, but 25 : 36. The duplicate ratio of two straight lines is the ratio of the areas of the squares described on them. This ratio is of importance in the theory of similar plane figures, for it is proved in geometry that the ratio of the areas of two such figures is equal to the duplicate ratio of any corresponding linear dimensions. If one square has its diagonal twice as great as that of another square, its area will be four times that of the second. If the diameters of two circles are in the ratio of 3 to 4, their areas will be in the ratio of 9 to 16. The same rule applies to any pair of similar plane figures. In the case of similar solids we find their volumes are in the *triplicate* ratio of corresponding linear dimensions —*i.e.* proportional to their cubes. Thus, if the diameters of two globes are in the ratio of 1 to 2, their volumes will be as 1 to 8.

Dupuis, Charles François (1742–1809), a French man of letters, was the son of a village schoolmaster in the department of Oise. At 11 years old he attracted by his talent the Duke of Rochefoucauld, who put him to college. At the age of 24 he was professor of rhetoric at Lisieux. He was a good Latinist, and two of his discourses were much admired. He studied under Lalande, and published in 1781 a memoir on the origin of the constellations. His anti-religious spirit brought him into some disrepute ; but it brought him to the notice of Frederick the Great, who invited him to Berlin, but he died before the invitation could be accepted. In 1787 he was professor of eloquence at the Collège de France, and in the Revolution he was a member of the Five Hundred and president of the Directoire Exécutif. His chief work was *Religion Universelle* (1795), in which he spoke much of Upper Egypt as the cradle of religion.

Dupuy de Lôme, Stanislas Charles Henri Laurent, French naval engineer, was born in 1816 at Ploemeur, near Lorient. Between 1848 and 1852 he built the first screw line-of-battle ship, the *Napoléon*, and in 1859 the first armour-plated battleship, the *Gloire*. He had in the meantime been appointed inspector-general of the navy. In his later life he conducted many interesting aeronautical experiments, and invented a balloon which possessed a certain extent of steering-power. His death occurred in 1885.

Duquesne, Abraham, French admiral, was born at Dieppe in 1610, and is best known as the rival of the great De Ruyter in 1676. In 1672 he commanded part of the French fleet that should have co-operated with the English at the battle of Solebay ; but he allowed personal jealousies on that occasion and on many others to interfere with his duty. He distinguished himself by bombarding Tripoli in 1681, Algiers in 1682, and Genoa in 1684. Although a Protestant, he was, on account of his services, excepted from the proscription that resulted from the revocation of the Edict of Nantes in 1685 ; but as the exception extended only to him, and not to his children, who were banished, the last days of the old seaman were greatly embittered. He died in 1688.

Duran, Carolus, a French painter, was born in 1837 at Lille. After studying in Paris, in Rome, and in Spain, where he was considerably influenced by the paintings of Velasquez, he exhibited in 1866 *l'Assassine*, for which he received a medal. He afterwards devoted himself to portrait-painting, among his most successful portraits being one of his wife and one of Madame Leydeau (1870).

Durango, called also Ciudad de Victoria, a town of Mexico 500 miles N.W. of Mexico, founded in 1559, and situated on a plateau 6,700 feet above sea-level. It is well built, and has a cathedral, mint, theatre, tramways, and telephones. The state of the same name is traversed by the Sierra Madre, and has an area of 54,000 square miles. Some iron and nickel of supposed aerolitic origin is found.

Durâni, the largest and most powerful division of the Afghân nation, and since 1747 the political rulers of the country, occupying the whole of the Helmand Valley between Kandahar and Herat, and also the Kabul district as far as the foot of the Hindu-Kush. Two main divisions, *Zirak*, with four branches ; Popalzae, Barakzae (the royal sept since 1818), Alikiozae and Achakzae ; *Panjpas*, with five branches : Nurzae, Alizae, Ishakzae, Khugiani, Maku, with nearly 150 clans altogether and total population about 850,000. The Abdali, as they were formerly called, took the name of Durâni in 1747 when Ahmad Khan, on the death of Nadir Shah, founded the present Afghân State and assumed the title of *Dur ed Durân*, "Pearl of the Age." Thanks to their closer contact with Persia, the Durâni were always distinguished above the rest of the nation, and even above the Ghiljis, who were the ruling branch before them, by a higher degree of culture and a more elevated sentiment of national dignity. The Ghiljis themselves, despite their hereditary jealousy of the present rulers, recognise the superiority of the Durâni above all the divisions of the Afghân people. The Durâni have a special veneration for Kandahar, which, though not the present capital, is regarded by them as the cradle of their race. (Ferrier, *History of the Afghâns*, 1857 ; Thornton, *Gazetteer*, 1844 ;

Leech, *Account of the Abdalees* in *Journal of the Asiatic Society*, 1845.)

Durazzo (in Turkish *Dratsch ;* Slav *Druz ;* the Greek *Epidamnus* and Roman *Dyrrhachium*), a port of Albania, on the Adriatic, 50 miles S. of Scutari. The port is silting up, and the fortifications are in ruins. A Corcyrean colony at Epidamnus brought about the Peloponnesian war by getting into conflict with their parent city in 426 B.C. In Roman times the town was an important stage on the road to Greece, and is associated with the history of Cæsar and Pompey. In 1081 it was the scene of hostilities between Robert Guiscard and Alexander Comnenus. Only a few fragments of the ancient city remain.

Durban, the port of Natal situated almost at the intersection of the 30° S. latitude and 31° E. longitude, is on the northern shore of a bay almost enclosed by the land. The climate, though hot, is healthy and suitable for Europeans, who form nearly half of the population. There are some good public buildings, and fair roads with side-walks, and the town is supplied with water from the river a few miles away. There are Town and Botanic Gardens, two parks, and a race-course ; a tramway of 4½ miles leads through the main street, and to the European quarter on some low hills overlooking the town, and the government railway to the interior has its terminus here. The town was founded by the Dutch, who had a republic here till 1842. There is an inner harbour of 4,700 acres, and 27 feet deep, and a new breakwater has been constructed.

Duren (the Roman *Marcodurum*) a Prussian town on the right bank of the Roer, 16 miles N.E. of Aix-la-Chapelle, a stone bridge crossing the river. The industries are steel and iron, woollen, paper, and leather manufactures, and there is a trade in corn and cattle. Some brandy is distilled here.

Durer, ALBERT (1471–1528), a noted German engraver and painter, was born at Nuremburg. His father was a goldsmith, and would have brought up his son to the same calling, but the latter displayed a decided taste for painting, and entered the studio of Michel Wohlgemuth. He then travelled in Germany, the Netherlands, and Italy, and in 1494 came home and married, and three years later produced a portrait of himself and a notable engraving from the nude. In 1506 he was again in Italy, where he engraved and passed a year at Venice. He was befriended by Maximilian I., Charles V., and Ferdinand of Bohemia. In 1520 he was in the Low Countries, especially at Antwerp, and much of his best work seems to have been owing to the example of Flemish art. It is doubtful whether his painting would have brought him lasting reputation, but in engraving he is a great master. Of his known works there are 105 engravings on copper and 170 on wood, while some of his larger works were composed of many smaller plates. His faults are stiffness and indifference to perspective, but these are far outweighed by his excellencies. Among his paintings may be mentioned the *Fête of the Rosière*, which is at Venice, and *Christ Disputing with the Doctors*, and some portraits of his father, which are at Sion House. He sculptured in wood and ivory, and made architectural designs, and wrote a treatise upon fortifications and books upon art.

D'Urfey, THOMAS (1628–1723), poet and dramatist, was born at Exeter from a family of French refugees. He prepared for the bar, but turned aside to literature and wrote sonnets, ballads, odes, and about thirty pieces for the stage which were popular and were tainted by the licentiousness of the age. He was a friend of Addison and Steele, and satirised Charles II., Anne, and William III. In 1683 he published a *New Collection of Songs and Poems*, and in 1719–20 *Wit and Mirth, or Pills to Purge Melancholy*.

Durham, a northern coast-county of England lying between the Tyne and the Tees, having a length of 55 miles, a breadth of 35 miles, and an area of 973 square miles. The western part is occupied by the Northern Pennine range, rising to a height of 2,196 feet ; and eastward of this are bleak heights, throwing out spurs among which are fertile valleys through which streams flow. Of the rivers the principal are the Tyne, the Wear, and the Tees, which are navigable for a few miles. The geological formation is of mountain limestone, millstone grit, magnesian limestone, new red sandstone, with veins of basalt or greenstone ; and the county contains part of the Newcastle coalfield, and is, in fact, one of the most important coal-producing districts, a strike of the Durham miners sufficing to paralyse half the industries of the North. Those who know the Greta at its junction with the Tees will remember how the river has hollowed out for itself a channel in the limestone, in which the bather will not find a particle of mud. The moors of the west afford good pasturage for sheep. In the east of the county there is clay, upon which cereals are grown, and stock is raised. The alluvial bank of the Tees makes a good grazing-ground, and the short-horned breed of Teeswater cattle is famed throughout the world. The valley of the Derwent is well-timbered. The mineral productions of the county are coal, lead, limestone, black marble, zinc, ironstone, firestone, slate, millstone, and freestone ; and among the industries are mining, iron-smelting, shipbuilding, iron, coke, glass, and pottery making, and the manufacture of chemicals. The capital of the county is Durham (q.v.), and the other large towns are Stockton, South Shields, Sunderland, and Hartlepool. Durham is a county palatine, till lately in the jurisdiction of the Bishop, but now an appanage of the Crown. There are eight parliamentary divisions, returning each one member, and seven parliamentary boroughs. The Roman occupation is marked by several towns ending in "chester," and by the existence of altars, coins, and urns. In Saxon times the county formed part of the kingdom of Northumberland, and at a later period suffered much from the incursions of the Scots.

Durham (formerly *Dunholme*), a city and parliamentary borough on the river Wear, capital of the county of the same name. The town is built upon several heights, and has, besides its noted cathedral and castle, a town hall, a new hall, prison, grammar school, university, training college for mistresses, free schools, and several churches. The chief industries are the making of carpets and of mustard. The cathedral is on a kind of peninsula running east and west, and almost surrounded by the Wear, which flows in a picturesque ravine beneath. St. Cuthbert's shrine was established here in 995, and the present building was constructed by Bishop William in 1093, and its

DURHAM CATHEDRAL. (*From a Photograph by Messrs. Frith & Co., Reigate.*)

appearance justifies the description, "half church of God, half castle 'gainst the Scot." It is associated with both St. Cuthbert and the venerable Bede. The castle—now the University—was founded in 1072 by William I. A college was founded in 1290 by the Prior and convent; but this fell into abeyance, until the Dean and Chapter applied for a charter, which was granted in 1837, for the University already founded in 1832. In 1846 Hatfield Hall became incorporated with the University. Most of the University arrangements follow those of the older universities. Durham returns one member to Parliament.

Durham, JOHN, EARL OF (1792–1840), an English statesman, was born of an old county family. In 1813 he became member for Durham, and showed himself an ardent reformer. In 1828 he was created Baron, and in 1830 was appointed Lord Privy Seal in Lord Grey's ministry, and was employed to support the Reform Bill in the House of Lords. He afterwards was ambassador to Russia, and in 1838 was made Governor-General of Canada, of which colony he wrote a good report. Owing to complaints as to his administration, he left Canada of his own accord, and returned to England.

Durian, the fruit of *Durio zibethinus*, a large tree belonging to the *Sterculiaceæ*, commonly cultivated in the Malay archipelago. It is spherical, 6 to 8 inches in diameter, with a thick hard rind covered with strong sharp prickles. It is five-chambered, each chamber containing from one to four seeds as large as chestnuts, which are roasted and eaten. They are embedded in cream-coloured pulp with an odour of rotten onions or putrid meat, but with a delicious flavour, compared to a rich custard flavoured with almonds with suggestions of cream-cheese, onion sauce, and brown sherry. It is eaten when not quite ripe, raw, cooked or pickled, and is pronounced even by some Europeans to be perfect.

Durra, the Arabian name for the Indian millet, *Sorghum vulgare*, which is generally known in India as *Jowar*, and in the West Indies as *Negro* or *Guinea corn*. Of unknown origin, this strong-growing grass, which reaches 4. 8, or even 16 feet in height, and produces a crop of its round brownish-red grain upwards of a hundredfold that sown, is largely cultivated in China, India, Egypt, Equatorial Africa, Southern Europe, and the United States. Its sweet culm and its leaves, which are 2 inches broad and $2\frac{1}{2}$ feet long, afford excellent fodder; but it is still more valued as a cereal. In England it is used as poultry-food.

Duruy, VICTOR, a French historian born at Paris in 1811. At 19 he entered the École Normale, and in 1833 was appointed Professor of History at

Rheims, and a few months later at the Collège Henri IV. at Paris. He was (1863–69) Minister of Public Instruction, in 1867 he was made a member of the Legion of Honour, and entered the Academy in 1885. Among his works are historical geographies of Rome, the Middle Ages, and France; an *Atlas de Géographie Universelle;* and some histories, especially that of Rome down to the time of Theodosius.

Dussek, Ladislaus (1761–1812), pianist and composer. After being organist at Kuttenberg, he went to Prague, and from there to Belgium, where he acted as organist at Malines, and then at Bergen and at Amsterdam, where he first became associated with the piano. In 1783, being then 22 years old, he visited Emmanuel Bach, and then came to England with a musical scheme, which failed. In 1808 he came to Paris, and was patronised by Talleyrand, who made him director of concerts. Prosperity was too much for him. Among his works are 76 pieces for the piano, a "*Methode*," some unsuccessful operas, a *Messe Solennelle*, and some German oratorios.

Dusseldorf, a town in a district of the same name, in Rhenish Prussia, on the right bank of the Rhine at the influx of the Dussel, crossed by a bridge of boats, 24 miles N.W. of Cologne. It consists of the Altstadt, Carlstadt, and Neustadt, and was formerly surrounded by ramparts, which were converted into boulevards in 1802. It has good streets and squares, with gardens, flowers, and shrubs, and is adorned with statues and fountains. In the market place is a statue of the Elector John William, who in 1690 founded a picture gallery, most of whose former contents are now at Munich. Among the principal buildings are the Art Hall, the Gallery of Modern Paintings, the old electoral palace, the Governor's residence, the observatory, the town hall, the theatre, and the library. Of the 25 churches, that of St. Lambert (14th century) and that of St. Andrew (the Hofkirche) are the most notable. There is a fine hofgarten. Dusseldorf is an important railway junction, and there are manufactures of iron and cotton. It was united to Prussia in 1815. Heine was born there.

Dutch Liquid, ethylene chloride ($C_2H_4Cl_2$), is an oily liquid formed by the action of chlorine upon ethylene (C_2H_4). Owing to the formation of this liquid, the latter compound is also known as olefiant gas. It boils at 85°, and has a chloroform-like smell. It acts as an anæsthetic, but is not much used for this purpose.

Dutch Metal is an alloy of copper and zinc, containing about three parts of the former to one of the latter. It has a yellow colour, and is very malleable, so that it may be obtained in thin leaves resembling, and often used instead of, gold leaf. It may be readily distinguished from the latter by its solubility in acids, and by the greater ease with which it tarnishes.

Dutens, Louis (1730–1812), an author who came to England, and was appointed chaplain and secretary to Stuart-Mackenzie, ambassador at the Court of Turin, and remained there as *chargé d'affaires*. He received a pension on his return, and was appointed Historiographer Royal, and was presented to the living of Elsdon by the Duke of Northumberland. He published an edition of Leibnitz's works, an English history, poems, and works upon theology, numismatics, and travels.

Duval, Claude (1643-1670), a famous highwayman, was born in Normandy, and came to England with the Duke of Richmond. His adventures, fabulous or other, are well known, as are the tales of his politeness in the exercise of his calling. He was hanged, and buried in Covent Garden church.

Duyker Bok (*Cephalolophus*, often incorrectly written *Cephalophus-mergens*), a small South African antelope, owing its popular name to the fact that it plunges through, rather than springs over, bushes and brushwood.

Dvoràk, Antonin (born 1841), a Bohemian composer of Mulhausen. In his childhood he went to Paris, and after a long and bitter struggle he composed a hymn and chorus for the organ, which brought him into notice. His *Stabat Mater* was performed in England in 1883. He has composed or collected many gipsy songs, and a strong national character pervades his works.

Dwair. 1. A large Berber tribe, settled on the shores of the great Salt Lake, province of Oran, Algeria. They have always been friendly allies of the French, and their chief was the famous Mustapha ben-Ismael, who fell in his eightieth year while serving under the French against Abd-el-Kader. 2. A Berber tribe in the uplands north-east of Boghar, province of Algiers.

Dwaish, a numerous people of the Upper Senegal Valley, North-west Africa, originally Berbers, but much mixed with Arab and Negro elements, and now speaking Arabic. They are conterminous on the east with the Brakna Moors, and claim as their territory all the land along the banks of the Senegal towards the north-west of Bakel. (General Faidherbe, *Annuaire du Senegal*, 1858.)

Dwalla, a Bantu people of the Cameroons district, West Africa, settled chiefly about the Lower Wuri and Cameroon estuary. They are the best known of all the natives of this region, having long dwelt in the vicinity of the European factories and missionary stations. The Dwallas are typical Bantus, with regular, almost European, features and well-developed lower extremities, in this respect presenting a marked contrast to the pure Negro races. Like the neighbouring Bakwiri they are well skilled in the "drum language," which is widely diffused amongst the coast peoples of the western seaboard. By this process of tom-toming and horn-blowing sentences are distinctly expressed, and news of all kinds rapidly communicated from tribe to tribe. The system is jealously guarded against women, slaves, and Europeans, not one of whom has ever succeeded in obtaining a clue to its interpretation.

Dwarf, a human being considerably below the normal height. Supernatural dwarfs play a great part in mythology and folk-lore. [ELVES, GNOMES, PIGMIES, FAIRIES.] Thus in Norse and German legends they are cunning miners and metal-workers, living among the rocks, and often entering into various relations with mortals. It is very probable that such stories may embody reminiscences of some prehistoric race of small stature, whom the entrance of later races into Europe drove to the woods and mountains (*cf.* the wood Veddahs of Ceylon). Reports of dwarf-races are common [PIGMIES], and the existence of the Bushmen and Akkas (the dwarfs who hampered Stanley so seriously in his latest expedition) indicates that they have a basis on fact. Dwarfs as cases of arrested growth are not unfrequent among races of normal height. There are records of a very doubtful character of adults below 2 feet in height; but there are many certainly ascertained cases below 3 ft. 4 in. The dwarf Richebourg (*see* below) was only 24 in. in height. About 90 years ago two women, "the Corsican Fairy" and "the Irish Fairy," were exhibited in London; the latter, 34 in., died in childbirth. A Dutch dwarf, 28 in. in height, was exhibited in London about 1815. At birth, of course, many dwarfs have been much smaller—*e.g.* the Pole Borulawski was 8 in. long at birth, and was taken to his christening on a plate. In court and social life dwarfs have sometimes been conspicuous figures—*e.g.* in the households of the Roman Emperors Augustine, Tiberius, and Domitian, and of many distinguished Romans under the Empire, as also in various European courts during the 16th and to the end of the 18th century. Thus Jeffery Hudson, originally one of the Duke of Buckingham's suite, became court dwarf to Charles I. Important foreign missions were sometimes entrusted to him, but he is best known from the fact that he killed a courtier in a duel. He is said to have been only 18 in. high at 30, but he grew afterwards. Richebourg, who had been in the service of the Orleans family, died in 1858 at the age of 90. Dressed as a baby he had once served as the vehicle of important despatches. The Polish dwarf, Count Joseph Borulawski, who led a life of considerable variety in the suite of Polish noblemen, was well known in Paris about 1775. Probably General Tom Thumb (Charles S. Stratton) is the best-known of modern dwarfs. Born at Bridgeport, U.S., in 1832, he was exhibited by P. T. Barnum in 1842, and visited Europe in 1844. He married another dwarf (Lavinia Warren, of Middlesbro', Mass.) in 1863 under the auspices of his showman, in New York. The wedding and the presents were fit for a princess. The pair, with the bride's sister, Minnie Warren, Commodore Nutt, and their baby, visited Europe in 1865. "The General" made a large fortune, but having (it was said) been unfortunate, revisited England some years ago. All these were perfectly formed. The baby died at two years old. A "miniature wedding" of the same kind took place at Charles I.'s court (the pair had several children, those who grew up reaching a normal stature), and another at the court of Catherine of Russia. While giants are usually good-tempered, slow, and somewhat feeble-minded, dwarfs are said to be ordinarily quick, irritable, and spiteful.

Dwight, TIMOTHY (1752–1817), an American Presbyterian writer born in Massachusetts. He was a Professor at Yale College at the age of 20, and became an army chaplain in 1777. In 1798 he became President of Yale College. His chief works are *The Conquest of Canaan* (a poem), *Theology Explained and Defended*, and *Travels in New England and the State of New York*, which are interesting as illustrating the period.

Dwina, or DUNA, the name of two Russian rivers. 1. The Western Dwina rises in a marshy forest in the district of Ostrakhof, 15 miles W. of the source of the Volga, and flows circuitously S.W. to the town of Vitebsk, when it flows N.W. and separates Vitebsk and Livonia from Minsk and Courland, and after a course of 500 miles falls into the Gulf of Riga 10 miles below the town. It is navigable for some distance during spring, but the stream is impeded by rapids. It receives several tributaries, and is liable to inundation. Fish are plentiful. 2. The Northern Dwina is formed in the government of Vologda by the union of two smaller streams, and flows N., and after a course of 400 miles falls into the White Sea, 30 miles below Archangel, by several mouths, forming an island delta. By a system of canals it is the means of uniting the White, Black, Baltic, and Caspian Seas.

Dyce, ALEXANDER (1798–1869), critic and commentator, was born at Edinburgh, and educated at Edinburgh High School and at Exeter College, Oxford, where he graduated in 1819. He entered Orders, but abandoned them for literature. He began with *Extracts from Quintus Smyrnæus*, and *Specimens of English Poets*. He brought out an edition of Shakspeare and other poets, and in 1831–35 an edition of Shakspeare's poems. Besides several essays, he wrote *Recollections of the Table-Talk of Samuel Rogers*.

Dyce, WILLIAM, R.A. (1806–1864), a painter, born at Aberdeen and educated at Marischal College in that city. In 1825 he went to Rome and showed a tendency towards pre-Raphaelitism. He exhibited at Edinburgh in 1830 and in 1844 was appointed Professor of Fine Arts at King's College, London. He was chosen to aid in the decoration of the Houses of Parliament and of Osborne House. He became A.R.A. in 1844, R.A. in 1848. He was also an author, having brought out an edition of the Prayer-Book and a work on *Plain Chaunt*.

Dyeing. The art of dyeing consists of the fixing in fabrics of colours in such a manner that the colour is of a fairly permanent character. As many passages in older writings show, the art was practised by the ancients; thus the Tyrian purple is alluded to by Pliny, and was probably known 1000 B.C. The Phœnicians and Egyptians were well acquainted with various processes for dyeing materials, and manufactured some of their colouring preparations on the large scale. In Europe the

knowledge appears for some time to have been restricted to the Jews. In the 15th century, however, dyeing in various shades and colours was well known in Europe, and the first text-book upon the subject appeared in 1540, while other books of this period are extant, containing recipes for the preparation of many dyes. The artificial preparation of innumerable dyes from coal tar, which followed Perkin's preparation in 1856 of the first dye from that source, has had the greatest possible influence upon dyeing, and marks the present century as a most important epoch in the history of the industry.

Before dyeing a fabric it is essential that it should be perfectly white and scrupulously clean, as not only would any colour upon the material serve to materially detract from the brilliancy and alter the shade of the dye, but it is also found that a small quantity of impurity has often a great and generally deleterious effect upon the colour. The first process, therefore, in dyeing, is the bleaching of the fabric, which should be of a thorough character, followed by washing in several changes of water. [BLEACHING.] From the above also it is seen that it is necessary that the water employed throughout should be of a high degree of purity, for although in certain cases the presence of particular salts may be unprejudicial, or even desirable, it is always better to add them, as required, to the pure water.

The method employed varies according to which of two classes of dyes is used. Those of the first class have the power of directly fixing themselves upon the cloth, without the assistance of any other substance. In this case the dye is dissolved or finely suspended in water, and the material placed in the solution, and kept in constant motion in order to ensure uniformity in the dyeing. When the desired shade of colour is obtained the material is taken out, well washed in a large supply of water, and dried. This mode of dyeing is of more frequent application with wool and silk than in the case of cotton, etc. In the other and larger class of dyes, however, simple immersion does not suffice, and it is necessary to fix in the cloth some substance —the *mordant*—which causes the adherence of the dye to the fabric. In many cases, also, the dyestuff itself is colourless or nearly so, and union with the mordant is necessary for the development of the colour, which may vary according to the particular mordant employed. In such cases the cloth is generally impregnated with the mordanting substance before the application of the dyestuff. This is generally done by boiling with, or passing through, a hot solution of the mordant, and pressing off the excess by rollers. It is then treated with the dye in the ordinary manner. In some cases, however, the fabric is treated with the dye first, and in other cases both mordant and colouring material act simultaneously upon the cloth. With regard to the theory of the nature of the process, it seems probable that in some cases there is merely a physical attraction between the colouring matter and the fibres of the fabric, while in others true chemical combination occurs. When mordants are employed their function seems to be to combine readily with both the fibre and the colouring matter, so that the colour produced by its union with the latter is fixed in the fabric. It thus appears evident that the nature of the mordant must vary with that of the dyestuff: in the case of dyes of an acid nature, basic mordants are required, and with basic dyes, acid mordants must be used. The principal mordants for general usage are the following:—(1) Metallic salts, which are used as basic mordants, *e.g.* alum, chromium salts, nitrate or sulphate of iron (copperas), and tin salts, more especially the chloride $SnCl_2$, known in the trade as tin crystals. (2) Acid mordants, employed for fixing basic dyes, *e.g.* tannic acid and various fatty acids generally prepared by the addition of sulphuric acid to a fat or oil.

The dyestuffs employed are exceedingly numerous. They may be divided into (1) those obtained directly from natural products, as from decoctions of barks of trees, animal products, etc.; (2) inorganic pigments, or coloured salts, such as lead chromate, which are frequently formed from their constituents during the process itself; (3) artificial organic dyes, now the most important class. The greater number of these latter are obtained from coal-tar, and known as coal-tar colours. Many of them are of the chemical nature of amines (q.v.), and require basic mordants; others are related to phenol, and require basic mordants; some are obtained from naphthalene or anthracene (q.v.); and a large number are related to a compound known as azobenzene ($C_6H_5N \cdot N \cdot C_6H_5$). These latter have within recent years acquired considerable importance, as very many have the power, possessed by few other dyes, of dyeing cotton without a mordant. Some of the commoner dyes required for particular colours are the following:—

Red. Chief are *cochineal* for wools, and *madder* or the artificial *alizarin* for cotton. In the first case, the wool is mordanted by boiling with tin-salts, and, after washing, brought into a boiler containing the cochineal in suspension, and there boiled until the colour of the liquid is discharged. This gives a scarlet, but other mordants give other colours; thus by the use of alum a crimson is obtained. For cotton the madder is now largely replaced by alizarin, as better tints may be obtained by the use of the artificial colour. The mordants employed are generally tin-salts or alum. The cotton is treated before the operation with an oily emulsion, and after dyeing the colour may be brightened by boiling with soap or alkalis.

Blue. *Indigo* is the chief dye employed. This dye is insoluble, and cannot therefore be used by itself. If reduced, however, a substance known as *indigo white* is obtained, and this, dissolved in an alkali, is generally employed. The cloth is agitated in this solution, and after a sufficient time withdrawn. Though not coloured when taken from the liquid, the colour makes its appearance when the fabric is exposed to the air. A sulphate of indigo is also much employed for wools and silks. *Prussian blue* is also employed for blues. The material is first soaked in nitrate of iron, and then washed. Some oxide of iron is thus formed in the material, and this, when the fabric is treated with yellow

prussiate of potash (potassium ferrocyanide) and an acid, yields Prussian blue, which is hence formed in the fibres of the cloth. Many aniline blues, as *spirit blue*, *methyl violet*, *water blue*, are also largely employed with wool or silk, and give beautifully brilliant colours. They have all a complicated composition, but are mostly derivatives of *triphenyl methane*, $C(C_6H_5)_3H$.

Yellow. The chief natural yellow dyes are *fustic yellow*, a dyestuff obtained from the bark of a Central-American tree, and *Quercitron* bark. A number of artificial yellows are known. Amongst these may be mentioned—*lead chromate*, which is formed in the fabric by treating with (1) lead acetate. (2) potassium chromate; *picric acid*; *naphthol yellow*, derived from naphthalene; *rosolic acid* and *aurine*, related to the triphenyl methane mentioned above; and a number of dyes derived from azobenzene.

Greens, *purples*, etc., can be often obtained by a judicious mixture of two dyes. Fine greens and purples are also given by different coal-tar colours, while madder used with an iron mordant also gives a purple.

For *black* dyes, logwood is generally used for wool and cotton, gall-nuts for silk, while aniline black may be also employed. Wool is heated in decoction of logwood, and then with sulphate of iron, and may or may not be first dyed with indigo. In silk-dyeing a decoction of gall-nuts takes the place of that of logwood. [CALICO-PRINTING.]

Dyer, GEORGE (1755–1841), scholar and antiquary, was born in London, and educated at Christ's Hospital and at Emanuel College, Cambridge, where he graduated in 1778. He occupied himself for a time as a tutor, and settled in London in 1792. In 1814 he published a *History of the University and Colleges of Cambridge*, and in 1824 a work on *The Privileges of the University of Cambridge*. He also did much of the work for Valpy's Classics, and wrote in magazines. He was a friend of Charles Lamb, who makes mention of him.

Dyer, JOHN (1700–1758), poet, was born in Caermarthenshire, and educated at Westminster. He at first adopted his father's profession—that of the law—but abandoned it, and wandered in Scotland, Wales, and England, enjoying the country scenery. In 1727 he wrote *Grongar Hill*, a poem marked by simplicity and an appreciation of scenery. He then went to Italy, and published in 1740 *Ruins of Rome*. In 1757 he published *The Fleece*. He died a Lincolnshire vicar.

Dyer, THOMAS HENRY (1804–1888), archæologist and historian, was born in London. He went to the West Indies, and was for a time employed in trade, which he afterwards abandoned for literature. He travelled much, giving special attention to topography. He wrote histories of *Modern Europe*, *The City of Rome*, *The Kings of Rome*, and *Pompeii*. He also wrote upon ancient Athens, and provided many articles for Dr. Smith's dictionaries.

Dyke. 1. In *Geology*, a vertical or highly inclined sheet or vein of intrusive igneous rock, from an inch or two to 60 or 70 feet thick, extending for a few yards or for many miles, the thicker ones being generally more persistent. They may consist of granite, pegmatite, or eurite, but are more typically basaltic, basalt, dolerite, diabase, and diorite commonly occurring in this form. They often exhibit prismatic jointing, the prisms being horizontal, at right angles, that is, to the surfaces of cooling of the dyke, and their outer surface is often glossy from a layer of tachylite (basaltic glass). Though they serve as girders binding together the loose tuffs of volcanic cones through which they are thrust, as in the Val del Bove, Etna, in Vesuvius, in Santorin, and at Funchal, they often traverse non-volcanic rocks for miles in straight lines, sometimes in parallel lines. Their material being often harder than the rock they traverse, denudation has left them standing out like walls (*Scotice*, dykes), as is the case with the diabasic Great Whin Sill of the North of England, along part of which the Roman wall was carried. In other cases the dyke has been disintegrated first, leaving deep ditch-like ravines. Dykes frequently graduate into veins or sheets. They alter the rock they traverse, indurating clay into porcellanite and converting chalk into crystalline marble, as in Rathlin Island, or coal into soot, or at a greater distance into graphite, as at Cumnock in Ayrshire.

2. In *Engineering*, means an embankment of earthwork generally erected to ward off water from a tract of land. Dykes are necessary in low-lying countries like Holland, where inroads are frequently attempted by the sea. They must be well and strongly built, and repairs must be effected as soon as any damage is done. The bursting of dykes has caused immense loss of life and property in Holland, Hungary, China, and elsewhere.

Dykes, JOHN BACCHUS (1823–1876), composer, was educated at Cambridge, and took Orders in 1847. In 1849 he was appointed Precentor of Durham cathedral, and in 1861 became Mus. Bac. of Durham University, and in 1862 Vicar of St. Oswald's. He contributed much to *Hymns Ancient and Modern*, and wrote the music of *Lead, kindly Light*; *Nearer, my God, to Thee*, and *Jesu, Lover of my soul*.

Dynamics is the study of forces. From Newton's definition of force we are able to see the natural divisions of the subject. This definition is as follows:—Force is that which changes or tends to change a body's state of rest or motion. It will be seen that there are four parts to the definition. Two of these lead to *Kinetics*, and the other two to *Statics*. The study of forces whose resultant action changes a body's state of rest or motion, is termed *Kinetics*; the study of forces which in combination only tend to change a body's state of rest or motion, is termed *Statics*. Many writers use the term Mechanics to include the whole subject, and divide it into the branches Dynamics and Statics, assigning to Dynamics the meaning that has been given above to Kinetics. Strictly speaking, the study of machines should be called Mechanics, which is, therefore, a special branch of Applied Dynamics.

In the case of forces acting on *water* or other

liquids, we speak of the science of Hydrodynamics, with its divisions Hydrokinetics and Hydrostatics. Applied hydrodynamics is usually termed *Hydraulics*.

In the case of forces acting on *air* or other gases, the term Aerodynamics may be used, with its branches Aerokinetics and Aerostatics. Applied aerodynamics is usually termed *Pneumatics*.

Finally, the investigation of the motions of bodies without regard to the forces that may be involved in the production of the motions, is in the province of *Kinematics*.

The force-relations with small bodies, whose magnitudes are negligible when compared with their masses, are usually discussed under the head of Dynamics of a Particle. Those bodies that are not strained by the forces acting on them, *i.e.* whose particles do not suffer any change in relative position to each other, are called *rigid* bodies, and their behaviour under the action of such forces gives us Rigid Dynamics or the Dynamics of Rigid Bodies. Whereas all solids become rigid under the action of sufficiently small forces, none are capable of remaining so if the stresses applied to them exceed definite limits. Principles obtained from a discussion of these two branches are employed in the extension to the dynamics of strained or discontinuous bodies, concerning which, however, comparatively little is known.

Starting with a consideration of motion itself, apart from any question of what may produce it, we first assign a definition. Motion is change of position. Change of position can only be recognised by comparison with the position of other bodies; this fact is expressed by the statement that we have only cognisance of *relative* motion. Thus, so far as appearances are concerned, there is no telling whether the earth is rotating round its axis from west to east, or whether the sun, moon, and stars are rotating round the earth from east to west.

If a rigid body move so that each particle in it travels along a straight line parallel to the path of every other particle, it will invariably present the same aspect in any given direction, and is said to have a *motion of translation*. Such a motion is instanced by the body of a railway-carriage that runs along a straight railroad. If the rigid body moves so that one set of points in a line is constrained to remain fixed, it is said to have a *motion of rotation* about that line as axis, as in the case of a flywheel on a piece of shafting. If it moves in any other way, its motion will at any instant be compounded of translation and rotation, as in the case of a wheel of the above carriage. It rotates about the axle, and the axle is translated bodily onwards.

Now the rate of change of position may be expressed numerically. It is called *speed*, and we find the average speed of a moving particle during any interval of time by dividing the distance it traverses by the time taken. The simplest sort of motion is uniform motion in a straight line; in this case we should obtain the same average speed whatever interval of space or time we happened to select for measurement. If a train travel 200 miles in 5 hours, its average speed is 40 miles per hour. If for this period of 5 hours its speed be uniform, we should obtain the same result—40 miles per hour—for any second or minute or hour during the whole five hours.

A body may move in a curved path with constant speed. Its *velocity* is in that case not constant, this conception involving the magnitude, direction, and sense of the motion [VELOCITY], and whereas the speed is constant because it only involves the magnitude of motion, the velocity varies because the direction of motion varies along the curve. Change of velocity is called *acceleration*, and is measured by the amount of change of velocity divided by the time taken to effect the change. When this rate of change is uniform, we have a constant acceleration, as in the case of a falling body near the earth's surface.

It is now necessary to come to the causes of change of motion. The whole science of dynamics is based on three laws formulated by Newton. They were not proved by him, nor by anyone else, being results obtained from experience. We find them true experimentally, and assumptions based on them do not lead to false conclusions. They may be thus stated:—

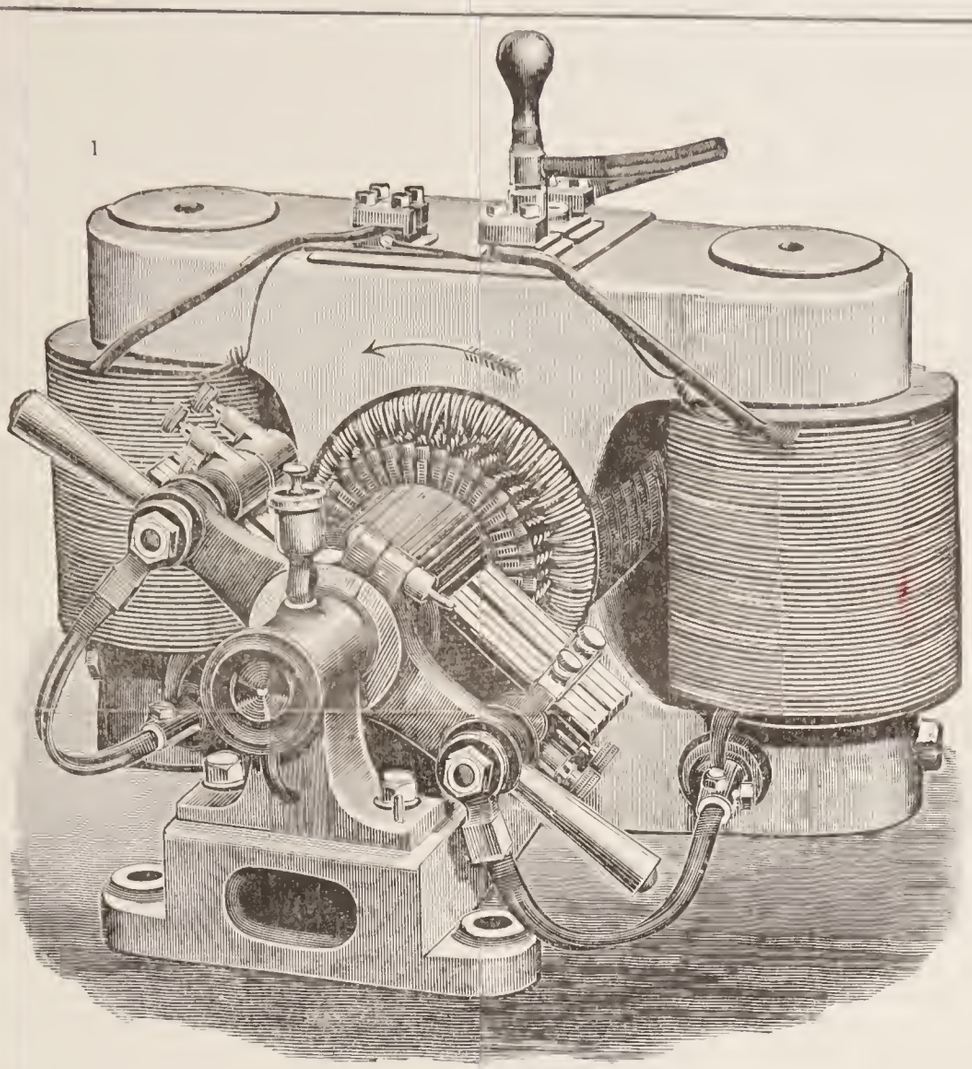
1. Every body continues in its state of rest or of uniform motion in a straight line, except in so far as it may be compelled by impressed forces to change that state.

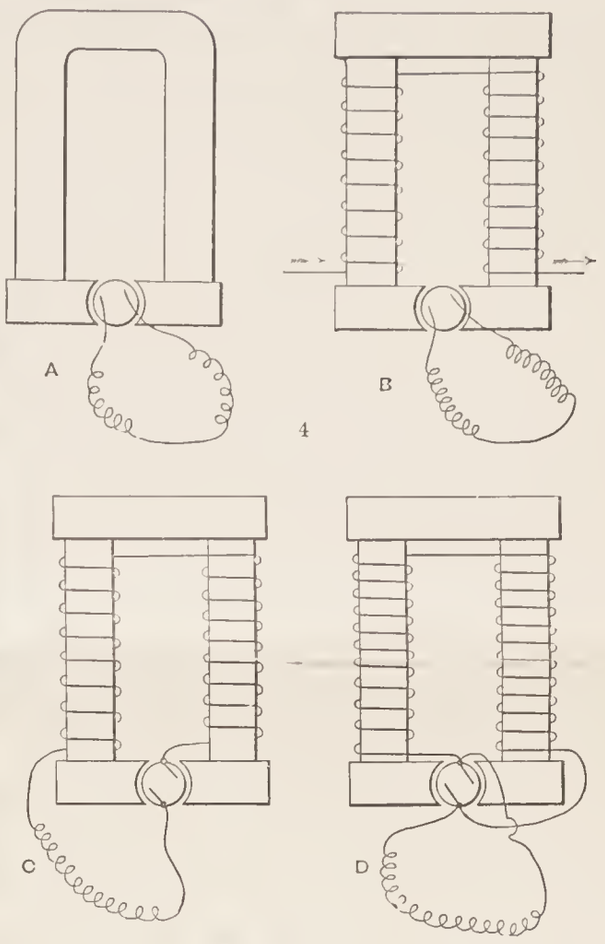
2. Change of motion is proportional to the impressed force, and takes place in the direction of the straight line in which the force acts.

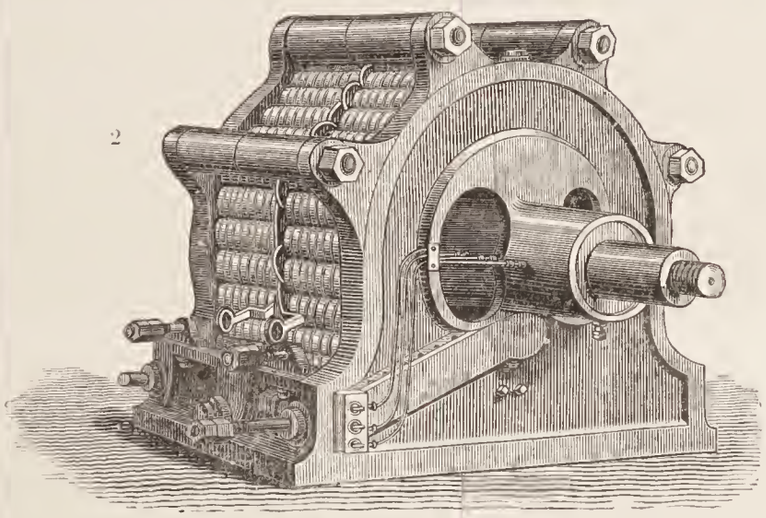
3. To every action there is always an equal and opposite reaction; or the mutual actions of any two bodies are always equal and oppositely directed.

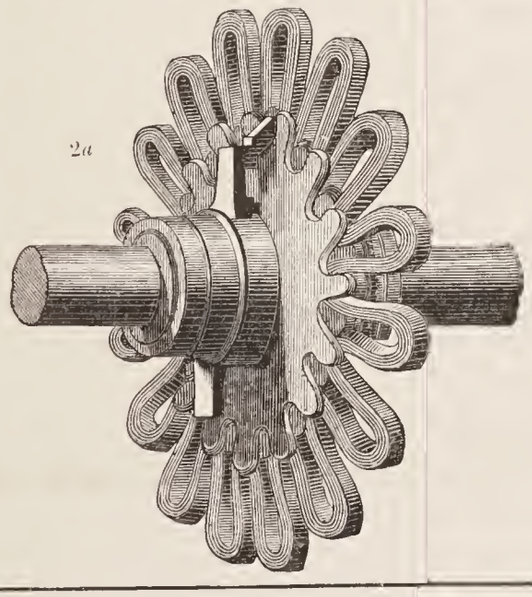
From the first law it is seen that if a body be motionless, or if it possess uniform motion in a straight line, such a state of things is permanent till fresh impressed force acts on it. Hence every impressed force produces an acceleration in the body; accelerations produced by different forces may or may not neutralise one another, but each being a measure of the effect produced is a measure also of the cause. The second is the law of quantity. It states that force may be measured by the amount of motion it gives to a body in a definite time. A standard force will give standard velocity to standard mass in standard time; or, using the centimetre-gramme-second system of units, we say that a force of one dyne will in one second impart a speed of one centimetre per second to a mass of one gramme. The amount of motion in a body is termed its *momentum*, and is measured by the product of its mass and its velocity. Change of momentum implies the action of force, and the time-rate of change is a measure of the force.

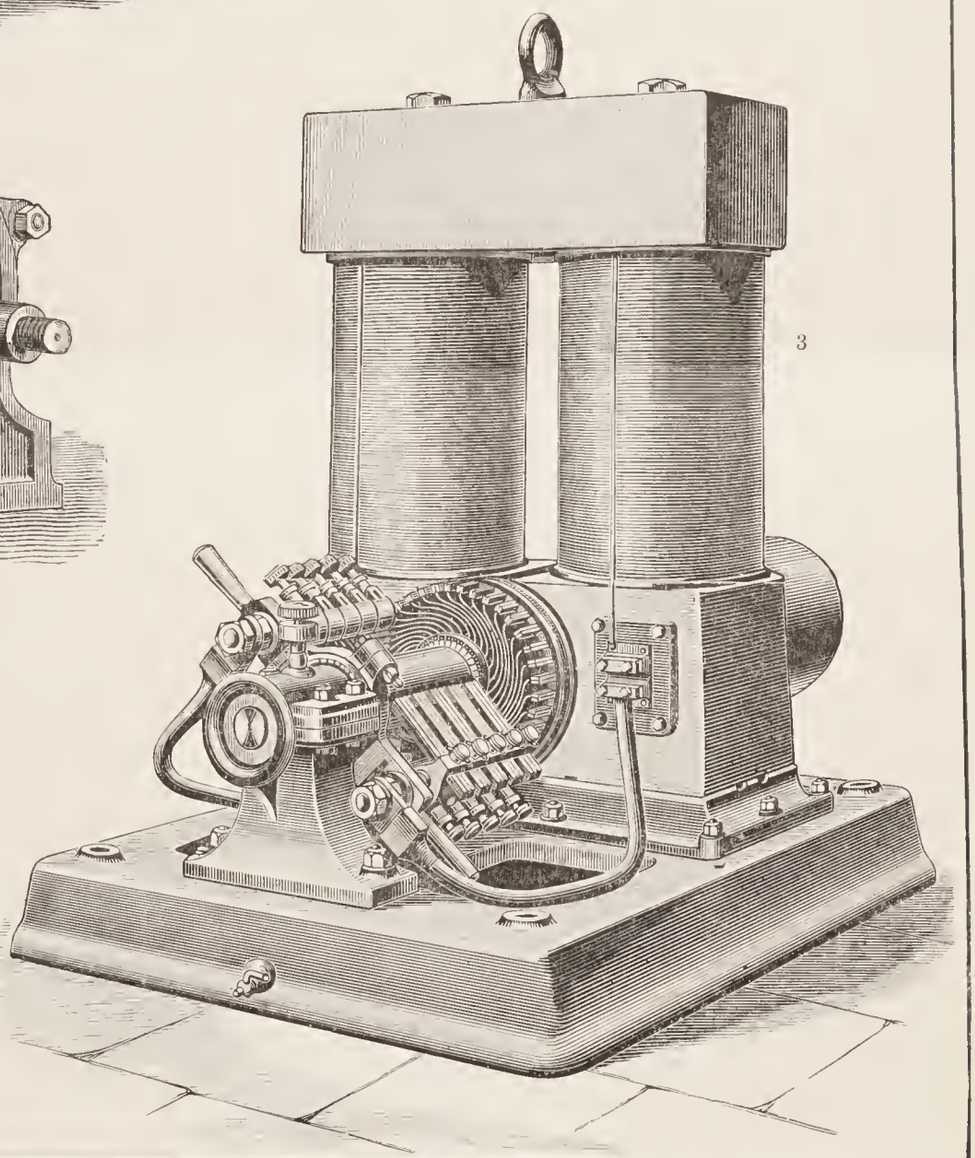
The third law admits of enormous extension, and may be interpreted as an enunciation of the principle of Conservation of Energy (q.v.). Primarily, it states that when two bodies act on one another the force that one exerts on the other is exactly equal to the force that the second exerts on the first. Hence the momentum given to one is equal to the momentum received by the other, and there is therefore no change in the momentum by their interaction, though there may be a redistribution of the same.











DYNAMOS.

1 The Manchester Dynamo. 2 The Ferranti-Thomson Dynamo. 2a The Ferranti Armature. 3 The Edison-Hopkinson Dynamo. 4 Diagrams of different types of Dynamos with rotating Armatures:—A Magneto-electric Machine; B Separately excited Field-magnets; C Series-wound Dynamo; D Shunt-wound Dynamo.

The dynamical notion of *work* is the production of motion against resistance, effected by the action of a force through a definite distance. To do work *energy* must be available, energy being measured by the amount of work it can do. If, therefore, a body possesses energy, and effects motion against resistance, the third law tells us that the resistance is of the same magnitude as the force exerted by the body, and that the energy spent by the acting body is taken in by the resisting body. There is, then, no loss of energy during the interaction, though it may change its form.

Energy may be given to a body by the action of a force thereon. We know that force may be required to change the position of a body; if this change is effected without dissipation of energy in friction, the body will either possess a finite velocity, or else occupy a position from which it will pass with accelerated motion if only it be not subjected to constraint. In the former case the energy it receives is *kinetic*, and in the latter case *potential*. [ENERGY.] Anything from which energy may be obtained is called a source of energy, though, strictly speaking, it is never more than a converter of one form of energy into another. The rate at which the supply may be obtained is called the *power* of that source. Any converter can supply an indefinitely large amount of energy if only sufficient time be given to it; but the more powerful the machine is, the less the time taken to render a given amount of energy available.

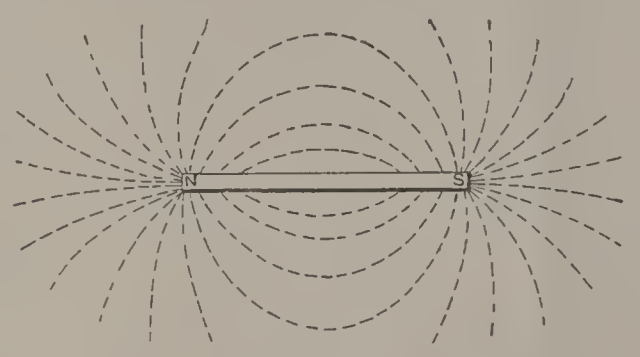
Dynamite. [NITRO-GLYCERINE.]

Dynamo. [DYNAMO-ELECTRIC MACHINERY.]

Dynamo-Electric Machinery is understood to class together all such machines as will convert energy of mechanical motion into that of electricity in motion, or the reverse. The former conversion is done by *dynamos*, to which power is given by steam-engines or other such prime-movers, and made to generate in conducting circuits alternate or direct currents of electricity. *Motors*, on the other hand, receive the energy of electrical currents, either alternate or direct, and this produces motion of certain parts of the structure. The theory of the action of a dynamo was first discovered by Faraday in 1831; it is intimately associated with that of a motor, for the principle of conservation of energy points out that either machine is reversible—that is to say, a dynamo may be used as a motor or a motor as a dynamo, though perhaps not so efficiently as when each fulfils the special function for which it was designed.

Lines of Force. In the neighbourhood of any magnet we know that magnetic force manifests itself. A small needle free to assume any position will adjust itself in a definite direction at any spot, evidently under the action of opposite forces at its extremities. If it were possible to isolate the north-seeking pole of the small needle, we should find it repelled from the north pole of the magnet and, if hindrance be removed, carried along a definite line till it reached the south pole of the magnet. Such a line is called a *line of force* in the magnetic *field*, the latter term representing all space where the magnetic influence is felt. The whole field is regarded as being mapped out with such lines of force, the closeness of their distribution in any region being proportional to the intensity of the force there. Faraday showed that such a distribution would be perfectly continuous; no line would terminate abruptly in space or merge into another line, but would travel from one pole of the magnet to the other, passing thence through the magnet back to its starting point.

Current Induction. If any substance be moved in any magnetic field so as to cut the lines of force, a disturbance of electricity is set up in the substance that is called a current. It is due to a difference of pressure or potential of electricity being induced in different parts of the moving mass by the passage of the lines of force through it, and unless infinite resistance be presented by the material an electric current must flow to equalise the potential. Energy



LINES OF FORCE OF BAR-MAGNET.

is required to produce this motion, and soon manifests itself as heat by the increase in temperature of the substance. When such currents run to heat in wasteful eddies they are termed Foucault currents; but the whole practical question of dynamos is to find the best means of utilising the available difference of potential for the production of an external current. This, for the most part, will sooner or later waste away in heat, but it may in the meanwhile perform useful work. Even allowing a rapid heat production, we may localise its intensity so as to produce useful light. All electric light represents a localisation of heat intensity into small mass, so as to get high temperatures and a consequent emission of light from the hot mass.

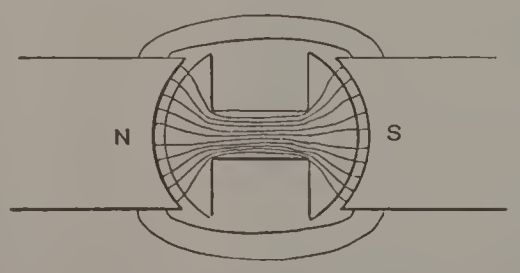
If then a wire be made to cut lines of force, a certain difference of potential is set up in the wire. This is proportional to the rate at which the lines are cut, and may be produced either by moving the wire through the field or by moving the lines of force through the wire. If the motion of the wire be reversed, the difference of potential produced will tend to send a reverse current. The accompanying sketch represents the simplest type of dynamo. The north and south poles of a magnet are arranged opposite each other, with a hollow cylindrical space between them. In this a wire bent into rectangular shape is placed so as to admit of rotation about its horizontal axis. The lines of force in the magnetic field are nearly parallel to each other, and pass across from left to right. Rotation of the wire must effect a cutting of these lines by the top and bottom portions of the rectangle, and a difference of potential, or

electromotive force, as it is called, will be induced in each portion; and because these are moving in opposite directions across the field, one moving down and the other up. the electromotive forces in each portion will be in opposite directions, and will therefore unite in sending a current through any conductor that joins the free ends of the wire.

This current will travel in one direction round the coil until half a revolution is completed. Then there is a reversal in the direction of the motion of each operating side of the rectangle, and a consequent reversal of the electromotive force (henceforth abbreviated E.M.F.) for the second half revolution. If this is gathered at the free ends without regard to the change in its direction, an alternating current will be produced in the circuit. But by means of an arrangement called a commutator (q.v.), which presents to one end of the external circuit always that terminal of the coil which is at the higher potential. and to the other end of the external circuit always the lower potential terminal, the direction of the current in circuit is rendered constant. The two great types of dynamo are now specified, *alternators* and *direct-current dynamos*. Both may be used for electric lighting, electric welding, for driving motors, and for the transmission of power by means of conductors; but only the latter for electro-plating, the charging of accumulators, or the magnetisation of iron.

From the above considerations we see that the induced E.M.F. in the moving coils may be increased (i) by making the field stronger in those regions where it is cut by the wire; (ii) by increasing the length of wire cutting the lines of force in such a way that a greater number are cut per second; (iii) by increasing the speed of rotation of the wire. The structure of wires or other conductors designed to cut the lines of force and induce an E.M.F. is called the *armature* (q.v.).

(i) With a field-magnet of given strength we cannot increase the total number of lines of force passing from pole to pole. But we may, to a great extent, direct them so as to strengthen the field locally, though other parts become weaker thereby. For wrought-iron possesses the property of conducting magnetic lines of force much more readily than any other substance, and will concentrate



LINES OF FORCE THROUGH SOFT-IRON CORE.

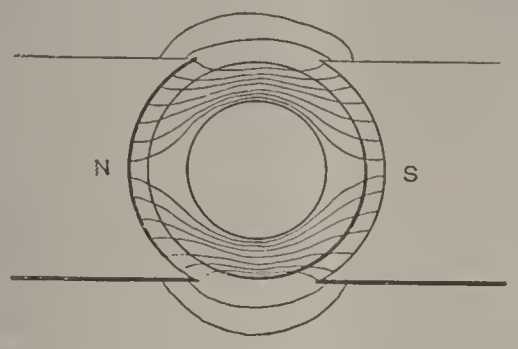
them in itself to a far greater intensity than will the surrounding air. In the sketch a shuttle-shaped core of wrought-iron is shown between the poles of a magnet, with the deflected lines of force passing through the metal. If coils of wire are wound round this core, the E.M.F. developed on rotation of such an armature will be much greater than when the iron core is absent. But besides increasing the local intensity of the lines of force in the above manner, it is also possible to increase the strength of the field-magnet, and so add to the total number of lines passing from pole to pole. If a permanent magnet be employed, it should be built up of thin laminæ of steel strongly magnetised and bound together. But if the magnetism be induced by an electric current flowing in coils of wire round a bent core of iron, we get the strongest effects by using the softest iron available, by having as many coils of wire wound round the core as circumstances permit, and by employing the greatest magnetising current available to traverse the coils. [MAGNETISM.] Finally, the pole-pieces of the field magnets should be so shaped and placed that there is only just room for the armature to lie between them.

(ii) Methods of winding on armatures must be largely modified by practical considerations of strength, compactness, speed of rotation, and the arrangement of the field-magnets. The armature may revolve in a fixed magnetic field, as in the case of the Edison-Hopkinson or the Ferranti machines; the field-magnets may revolve about a fixed armature, as with the Mordey alternator, or both may be fixed and the lines of force put in motion by a revolving iron-piece or keeper. Most machines are of the first type. Again, the magnetic field may be produced by a single magnet or by one or more pairs. The Edison-Hopkinson has a single electro-magnet with its poles brought near together and shaped to receive a drum-shaped armature. The Manchester has two electro-magnets, which unite in forming a single field; and the Ferranti alternator shown in the plate has sixteen pairs of bar electro-magnets ranged cylindrically, with each pair in a line, and separated only by a small space $\frac{7}{8}$ in. wide that receives the thin circular armature. The thirty-two magnets are so placed that opposite poles face each other, and that the lines of force pass direct across the gap that separates them. For one pair they pass across from left to right; for the next pair from right to left, and so on alternately.

The construction of the Ferranti armature is shown in the plate. Copper ribbon is coiled several times round in eight pear-shaped loops, preferably wound on brass or other non-magnetic bobbins. The current is generally taken off from opposite sides of the armature, to prevent any excessive difference of potential between consecutive coils. The separate layers of ribbon are insulated with asbestos.

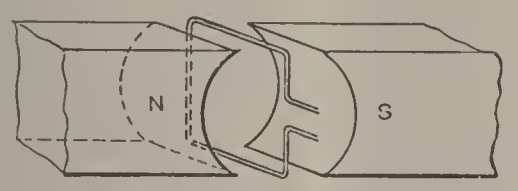
Direct-current armatures may be classed as drum or ring-armatures. The former type is developed from the **H** or shuttle armature of Siemens, which consisted essentially of an iron core with **H**-shaped section, round which wire was wound in the recess so as to form a cylinder that could revolve about its axis. (*See* sketch Armature.) The objection to this old arrangement was that the coils of wire were almost parallel to each other, and were all engaged in cutting lines of force at the same time; while some are cutting, the others should not be cutting, so that commutation shall produce a fairly constant current in the external circuit. The drum-armature has a cylindrical iron

core, upon which coils of wire are wound lengthways, their ends terminated at successive commutator segments at one side of the armature. The insulation of the separate coils is of great importance. Such an armature is possessed by the



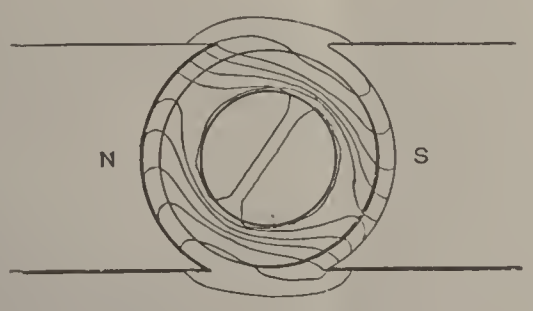
LINES OF FORCE THROUGH GRAMME-RING.

Edison-Hopkinson dynamo, and is shown in the plate. The ring-armature consists of a series of coils wound round a soft iron ring. The wire connecting each coil with the next is joined up with a metal segment on the axle of the armature. (*See* sketch Armature.) The set of segments, which are carefully insulated from each other, form a cylinder, upon opposite sides of which the brushes press which collect the current for the outside circuit. Each coil acts as a cell producing an E.M.F. in one



SIMPLE ARMATURE.

direction during half a revolution, and in the other direction during the second half. All the coils travelling round one side act as a battery sending a current upwards, and all the coils travelling round the other side send an equal current to meet the first. The brushes are placed so as to collect at the junctions of these two halves, and are made with sufficient bearing surface to keep two consecutive segments always connected. Owing to a twisting in the lines of force due to rotation of the



DISTORTED LINES OF FORCE THROUGH RING.

ring, the two coils that are producing no E.M.F. are not at the top and bottom of the armature, but at some angular distance from these positions. A definite *lead* or advance from the top or bottom is therefore necessary for the brushes. A ring-armature is illustrated in the figure of the Manchester dynamo. The core is built up of thin laminæ of soft iron, which prevent the formation of wasteful eddies in the metal.

(iii) The speed of rotation is limited by the strength of the rotating parts. Old armatures would fly to pieces if worked at modern rates of rotation. A speed of 600 revolutions per minute is common; the speed at the circumference of a Ferranti armature may exceed 6,000 feet per minute. For high speeds it is therefore necessary to ensure good mechanical design of the revolving parts. Uniformity of rotation is produced by having these parts very massive, or by the use of governors.

Classification of Dynamos. Dynamos that employ permanent magnets to produce the requisite fields are termed *magnetos*. Those that use separate currents from entirely different circuits to magnetise their field-magnets are known as *separately-excited* machines. In these two cases the strength of field is independent of the speed of rotation, or of any variation in resistance, etc., of the main circuit. But it is possible for the cores of wire round the field-magnets to form part of the main circuit. A little residual magnetism always exists in the cores, and suffices to start a current in circuit. This traversing the coils round the cores increases the strength of field, and consequently the strength of current produced, until the magnets become saturated, or the energy required to drive the armature at that rate too great to be supplied continuously. There are various branches of this type of machine, two of which are shown in the plate. The one is the *series* dynamo, where the whole current passes round the field-magnets. The other is the *shunt* dynamo, where a fractional portion of the whole supply is taken to the field-magnets, this fraction depending on the resistances of the field-magnet coils and of the external circuit. The advantages of these and other methods of magnetisation cannot here be discussed. Alternators cannot be self-exciting, for electro-magnets require direct currents. The Manchester dynamo in the sketch has both shunt and series coils, the Edison-Hopkinson only shunt coils.

Motors. As explained at the beginning of this article, a dynamo is a reversible engine. It can be worked as a motor. If a current be supplied at the brushes of a dynamo with rotating armature, that armature will be kept in motion. All electric motors are closely similar to dynamos in principle and in construction. They may be worked by direct or by alternating currents, and their efficiency is great. A problem occupying the minds of many at the present time is to obtain a good practical alternating motor that shall avoid the few difficulties now existing. One of these difficulties is that the motor must first be brought up to a definite speed before that speed can be maintained by an alternating current. There can be no doubt that the transmission of power may be most conveniently effected by electric currents, a dynamo at one end of the circuit converting kinetic energy into electrical energy, and a motor at the other end to effect the reverse conversion; and since alternate-current transmission is in many ways the better, alternating motors necessarily have a great future.

Dynamometer, in *Engineering*, is an instrument for measuring the power given out by an

engine of any kind. Such instruments are of two kinds, absorption dynamometers and transmission dynamometers. The former absorb all the power they are meant to measure, and must therefore be regarded as exceedingly wasteful, for the whole power of the engine is spent in the instrument, generally in overcoming frictional resistance. The latter absorb none and simply transmit the whole. They may therefore be employed when the engine is doing its ordinary work.

Dynastes is a genus of beetles including some of the largest known species. Some of them, such as the West Indian *D. hercules* (Linn.), are as much as six inches long.

Dyne, the centimetre-gramme-second unit of force—that is to say, it is a unit of force chosen so as to have simple relationship to the above-mentioned units of length, mass, and time. It is defined as the force that will in one second give a mass of one gramme a speed of one centimetre per second. It corresponds to the English *poundal*, which is based on the foot-pound-second-system.

Dysart, a seaport in Fifeshire, on the N. coast of the Firth of Forth, 13 miles N.E. of Edinburgh. In the fifteenth century there were salt works here, and some coal was worked in the sixteenth century. There is a flax factory here, and a harbour, and a space in the centre contains an old town hall. The old castle of Ravenscraig in the neighbourhood is utilised by Scott.

Dysentery, a disease characterised by inflammation of the mucous membrane of the large intestine. The mischief is said to involve, in the first instance, the solitary glands of the large intestine, which become swollen and hypertrophied, and if the attack be a severe one actual sloughs are formed, which are cast off, leaving patches of ulceration. These ulcers either heal with the formation of scar tissue, and consequent cicatricial contraction, or they remain open and irritable for a considerable length of time, giving rise to chronic symptoms of a peculiarly intractable character. The disease is, for the most part, limited to tropical countries. It is said to have prevailed largely in former days in England, but is now practically unknown, save in the case of those who have been to India or other warm climates. It is said by some authorities to be associated with aguish districts, but there is considerable difference of opinion in this matter. The main symptoms of the disease are fever, with diarrhœa and tenesmus. The discharges from the bowel contain mucus, and often blood. A fatal termination is not uncommon. In mild cases signs of amendment are manifested at the end of about a week. In the treatment of dysentry ipecacuanha has been found of service, and opium and astringents are of use in some instances. Abscess of the liver occasionally developes in persons who have been the subjects of attacks of dysentery.

Dyspepsia. [INDIGESTION.]

Dysphonia, difficulty in speaking, arising from disease in the larynx.

Dyspnœa, difficult breathing. [RESPIRATION.]

Dysporomorphæ, in Huxley's classification, a group of birds containing the cormorants.

Dysuria, difficulty in passing urine.

Dytiscidæ, a family of water beetles, of which the small black water beetle, *Dytiscus*, is the typical and best-known genus. The larvæ are, however, better known than the adult; they are popularly called "fresh-water shrimps."

Dzeren (*Procapra gutturosa*), an antelope from the arid plains of Central and Eastern Asia. It is about 30 inches high at the shoulder; greyish-fawn above in summer, becoming almost white in winter. The horns, present only in the males, are strong, black, and lyrate.

Dziggetai, one of the native names of *Equus hemionus*, the Tibetan Wild Ass. These animals, which live in small herds in the highlands of Central and Eastern India, stand about fourteen hands high, and are very swift and wary. There is a well-marked line on the back; but the shoulder-stripe, so conspicuous in the ass (q.v.), is wanting.

Dzo (LUSHAI), a numerous and warlike people on the north-east frontier of India between Hill Tipperah and Manipur west and east, and reaching southwards to the Chittagong district of Arakan; after long frontier troubles, finally reduced by the English in 1892. Dzo is the national name, though they are better known as Lushai, *i.e.* "Head-takers" (from *lu*, head, and *sha*, to cut) which is only the name of a particular clan. The Dzo are a branch of the wide-spread Kûki race [KÛKI], and are divided into a great number of clans, with three main divisions (Sukpilal, Lalbora, Lalhi), all speaking closely-related dialects of the same Tibeto-Burmese language, and numbering collectively from 70,000 to 80,000 souls. (G. H. Dament; Captain Lewin, *Exercises;* Br. Nath Shaha, *Lushai Grammar*, 1884.)

E

E, the fifth letter of the Greek, Latin, and modern European alphabets. The symbol represents the Phœnician *he*, which somewhat resembles an E reversed, and is said to have been derived from a hieroglyph representing a window. [ALPHABET; compare D.] In Phœnician *he* was the rough-breathing, the modern H sound; but the Greeks took it to represent that sound for which it now stands in languages of the Continent of Europe. Probably the "close" and "open" *e* sound ("met," "they") were represented in Greek by ε and η respectively [ETA]; but in modern Greek *eta* has the sound which in English is expressed by *ē* or *ee*, and in French and German by *i*. The letter E is of more frequent occurrence and is more variously sounded than any other in English. It is often mute. This is due partly to the fact that, as in French, the final *e* was often dropped in the 16th century but still written, and partly to the fact that other words

were written with final mute *e* by false analogy with those in which the symbol had survived the sound. In *Music*, E is the third note of the scale of C. For the E proposition (the universal negative), *see* LOGIC.

Eadmer, a Canterbury monk of the 12th century, was a friend of St. Anselm and of his successor. In 1120 he was invited to Scotland to become Bishop of St. Andrews, but returned to Canterbury owing to a disagreement with the King of Scotland with regard to his consecration. He wrote *Historia Novorum*, *Vita Anselmi*, and notices of SS. Dunstan, Bregwin, and Oswald.

Eads, JAMES BUCHANAN (1820–1887), an American engineer, was born in Indiana. He invented boats for raising sunken ships, and in the War of Secession built several ironclads for the Federal Government. In 1867 he built a steel bridge over the Mississippi at St. Louis, with a central span of 520 feet. He suggested the ship-railway, and he did much towards improving Mississippi navigation.

Eagle, a name for any of the *Aquilinæ*, a cosmopolitan sub-family of *Falconidæ* (q.v.), containing 31 genera, with 94 species, of raptorial birds longer than, but much inferior in courage to, the true falcons. The head and neck are feathered, and the bill is not toothed. The nine species of the type-genus *Aquila* from the Nearctic, Palæarctic, and Ethiopian regions and India, have the shank more or less completely feathered, and the edges of the upper mandible are indented. They frequent high cliffs and rocks, and prey on smaller birds, mammals, and sometimes, when better food is scarce, on carrion. The best-known species, and the only one ranging to America, is the Golden Eagle (*A. chrysaëtus*), now almost extinct in Britain, though some are preserved in the extreme north of the island. The male is about 30 inches, and the female about 3 feet in length. The general plumage is brown, with a tawny or golden tinge on the neck, whence the popular and specific names are derived. A good deal has been written about the "nobility" of this bird; but its true character is thus sketched by Macgillivray:—"Like other robbers of the desert he has a noble aspect, an imperative mien, a look of proud defiance; but his nobility has a dash of clownishness, his falconship a vulturine tinge. Still, he is a noble bird, powerful, independent, proud, and ferocious, regardless of the weal or woe of others, and intent solely on the gratification of his own appetites; without generosity, without honour, bold against the defenceless, but ever ready to sneak from danger. Such is his nobility, about which men have so raved." The Imperial Eagle (*A. imperialis*). the Russian Eagle (*A. mogilnik*), and the Spotted, or Screaming, Eagle (*A. maculata*) are found on the European Continent. The name Crested Eagles, or Eagle-Hawks, is sometimes given to birds of the genera *Spizaëtus*, from the tropics of both hemispheres, and *Morphnus*, from tropical America, though the latter belongs to the Buzzards, as does the Harpy Eagle (q.v.). In some species of *Spizaëtus* and in the single species of *Morphnus* there is an erectile crest. [BATELEUR, ERNE. HARRIER EAGLE, OSPREY.] The eagle was the sacred bird of the Greek Zeus and of the Roman Jupiter. and figures in many other mythologies, generally as an emblem of the sun. The myth of its renewing its youth is very widely distributed. Its powers of sight and of wing have caused it to be taken as a symbol of high and heroic qualities. In Christian art it typifies St. John the Divine. and a figure of an eagle is often used as a lectern in churches.

Eagle, a gold coin of the United States of the value of ten dollars, and at present of the standard legal weight of 258 grains. Taking the dollar at 4s. 1½d., it is equivalent to £2 1s. 3d. English. Its name, of course, is derived from the fact that the American eagle is stamped on its obverse. Double, half, and quarter eagles are also coined, and in the earlier days of the Republic all these coins were sometimes issued by private persons, as well as by the Government.

Eagle Hawk. [EAGLE.]

Eagle Owl. [OWL.]

Ear. The ear is usually described as consisting of three parts:—(1) The *external ear*, which includes the pinna, auricle, or lobe of the ear and the external auditory meatus; (2) the *middle ear* or tympanic cavity; and (3) the *internal ear*.

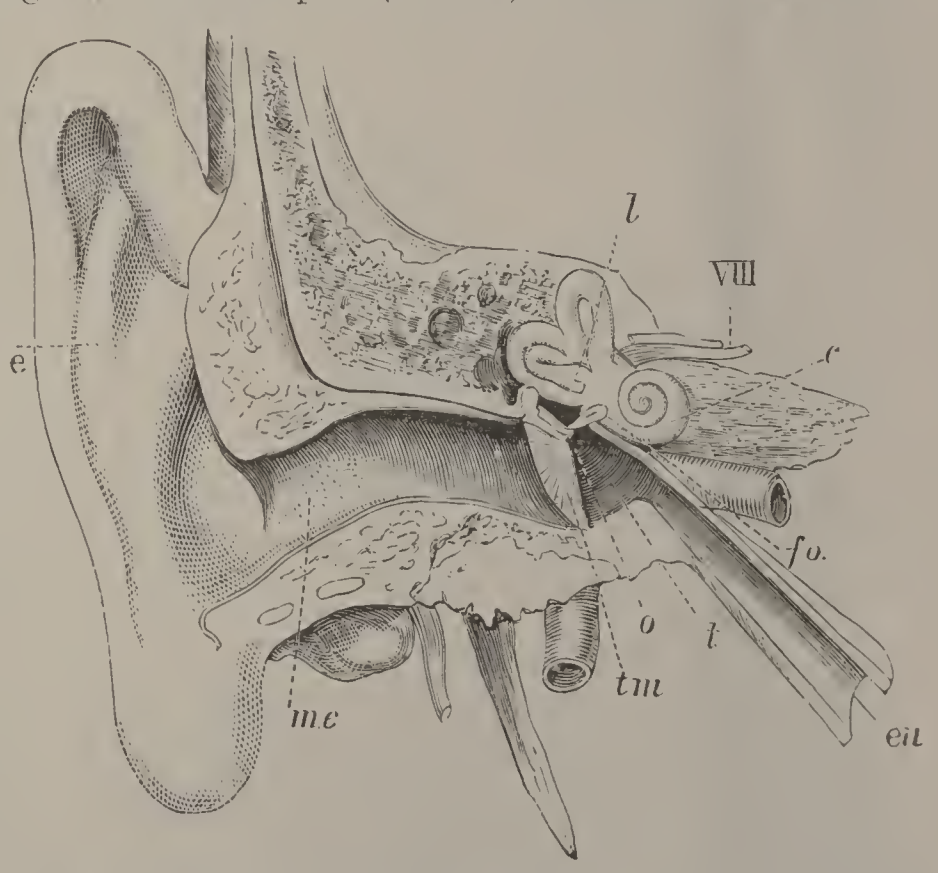


Fig. 1.—THE SEVERAL PARTS OF THE ORGAN OF HEARING (EXPOSED FROM THE FRONT).

a, External ear; *me*, external auditory *meatus*; *l*, bony labyrinth; VIII, auditory nerve; *c*, cochlea; *fo*, fenestra ovalis; *eu*, Eustachian tube; *t*, tympanum; *o*, auditory ossicles; *tm*, tympanic membrane.

1. The pinna or auricle consists of a framework of elastic cartilage, upon which the skin is moulded.

Names are given by anatomists to the different parts of the auricle: thus, the central hollow is termed the concha, the prominence in front of this the tragus, the ridges situated posteriorly are the helix and anti-helix, and so on. The auditory meatus is directed inwards and slightly forwards, and is closed internally by a membrane called the tympanum. The total length of the external auditory meatus from the concha to the tympanum is about an inch and a quarter; its outer portion is composed of cartilage, its internal part of bone.

2. The middle ear occupies a cavity in the petrous portion of the temporal bone; the tympanic membrane forms the outer wall of this cavity. Internally, the middle ear is placed in direct communication with the pharynx by the Eustachian tube; bounding the cavity posteriorly are the mastoid cells. Within the middle ear are the minute bones, which are known as the auditory ossicles; these ossicles are three in number, and are called the malleus, incus, and stapes. The malleus or hammer bone is attached by one of its processes (the handle of the hammer) to the tympanic membrane; the head of the hammer articulates with the incus or anvil bone, and this latter is attached to the stapes or stirrup bone; the base of the stapes fits into a small opening on the inner wall of the cavity of the middle ear, called the fenestra ovalis. This arrangement ensures the transmission of vibrations of the tympanic membrane to the base of the stirrup, and, as the fenestra ovalis is situated between the middle and internal ears, any movement of the base of the stirrup is communicated to the fluid of the internal ear, which bathes the inner

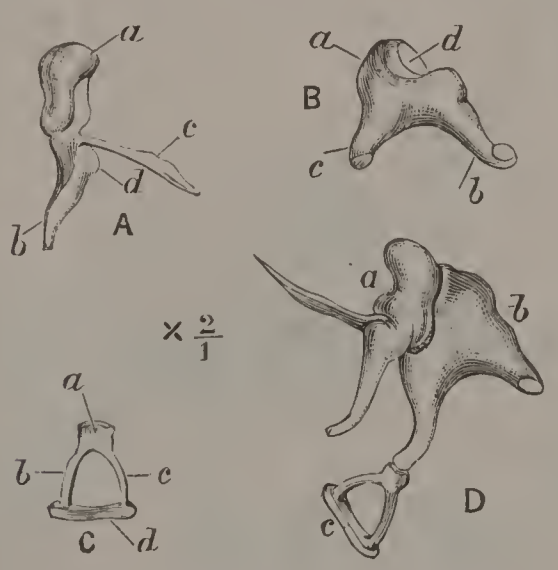


Fig. 2.—AUDITORY OSSICLES OF MAN (LEFT SIDE).
A, Malleus. *a*, head; *b*, handle; *c*, slender process; *d*, short process. B, Incus. *a*, the body; *b*, long process; *c*, short process; *d*, articular surface for head of malleus. C, Stapes. *d*, the base. D, The foregoing in their natural position. *a*, malleus; *b*, incus; *c*, stapes. (*Twice natural size.*)

wall of the fenestra ovalis. Thus, every movement of the membrana tympani throws into vibration the fluid of the internal ear. Beneath the fenestra ovalis there is a second window connecting the cavities of the internal and middle ears; this window is round, not oval, in shape, and is called the fenestra rotunda.

3. The internal ear consists of a cavity surrounded by a dense bony framework, known as the osseous labyrinth. This framework encloses a sac, which is called the membranous labyrinth. In the space included between the osseous and membranous labyrinths is a fluid, called perilymph, while the fluid contained within the membranous labyrinth itself is called endolymph. The osseous labyrinth is made up of three parts—the *vestibule*, *cochlea*, and *semicircular canals*.

The *vestibule* is situated between the cochlea anteriorly and the semicircular canals behind; its

Fig. 3.—COCHLEA WITH PART OF ITS WALL REMOVED.
a, central pillar; *b*, spiral partition; *c*, scala tympani; *d*, scala vestibuli.

inner wall is pierced by the auditory nerve, and on its outer wall are the two windows (the fenestra ovalis and the fenestra rotunda) already alluded to.

The semicircular canals are three in number (anterior, inferior, and horizontal); each canal presents a dilatation at one point, which is called the ampulla.

The *cochlea* is shaped like the shell of a snail, and is formed by a spiral canal which winds two and a half times round a central axis. If the cochlea be divided through the middle, it is found that the spiral canal throughout its whole length is divided into compartments, known as the scala tympani and scala vestibuli, which communicate at the apex of the cochlea by a small aperture, the helicotrema. In the fresh state a small portion of the scala vestibuli is separated off by a membranous partition forming the scala media, in which is found a very complex structure which runs spirally round the axis of the cochlea, supported upon the basilar membrane of the scala media, known as the organ of Corti. This last-named structure consists of a series of internal and external pillars known as the rods of Corti, which form the walls of a tunnel running spirally round the axis of the cochlea; the tunnel supports a series of cells, furnished with minute hairlike processes, called the inner and outer hair cells; these hair cells are supposed to be in direct communication with the terminal fibrils of the auditory nerve.

Physiology of Hearing. The function of the external ear is to transmit and conduct the vibrations of the air to the membrana tympani; the vibrations of this last-named structure are, as has been seen, propagated by means of the auditory ossicles to the fluid of the internal ear, and finally the disturbance reaches the organ of Corti. The exact manner in which the physical disturbance leads to the production of impressions of sound is not understood; it is supposed that the part played by the cochlea is an essential one, and the air cells are usually credited with being the sound-perceiving

organs. The semicircular canals seem to have a special and very peculiar function; it appears from experiments which have been made upon pigeons that injury to these structures is followed by a loss of the power of co-ordination of muscular movements, and it is supposed that variations of pressure of the fluid within the semicircular canals produce sensations which convey to the mind the means of forming a correct idea as to the position of the head with respect to external objects. When the semicircular canals are injured, the sense of position is on this hypothesis lost, and a disturbance of equilibrium is apt to result. The function of the Eustachian tube is probably that of regulating the pressure of air in the tympanic cavity.

Earl, the name of the third rank in the English peerage, as well as of the "courtesy title" borne by the sons of marquises, and occasionally of dukes. In Anglo-Saxon England we find the words *eorl* (earl), and *ceorl* (churl), respectively used for the noble and the non-noble, but free man. According to Professor Freeman, "they mark the distinction of gentle and simple." This nobility, however, was supplanted by the nobility of of *thegns* (thanes), or *comites* (the king's companions in war, attached to him by a special and personal tie, and commonly holding some office under him). Under Cnut the term was taken to denote the under-kings of the divisions of England, and made to correspond to the foreign term count or *comte* (comes), the equivalent of the *thegn*. An earl, in fact, was the governor of a county as the ealdorman had been in Anglo-Saxon times. Under the Norman kings the earl or count was still such a governor, but the title gradually became dissociated from official rank. Sometimes it passed by inheritance, sometimes by marriage, sometimes both title and office were suspended by the Crown. Edward III. created earls as a hereditary rank, and this, of course, helped to make the dignity purely titular. An earl's wife has the foreign title of "Countess." The earl's coronet is composed of eight golden leaves, connected together into a wreath; between each pair rises a golden spike or ray topped by a pearl. The countess's coronet is precisely similar. The earl is styled "Right Honourable," and commonly addressed by the Crown in official documents as "our trusty and well-beloved cousin." His sons are "Honourable," his daughters "Ladies" by courtesy. [DUKE.]

Earle, WILLIAM (1833–1885), an English military officer, was born at Liverpool. He entered the army in 1851, and fought in the Crimea. He was military secretary to the Governor-General of India (1872–76), and commanded the garrison of Alexandria (1882–1884). He was killed in the Gordon Relief Expedition while engaged in storming some Arab entrenched positions. He had attained the rank of major-general.

Early English Style, THE, in the history of English architecture followed the Norman Style, and prevailed for about a century (between 1185 and 1300). It first appears during the building of Canterbury cathedral, and the choir and transepts of Rochester cathedral are an early instance. As compared with the Norman Style, it exhibits great lightness; long, narrow lancet-shaped windows and sharply-pointed arches take the place of the Norman round arch, and slender pillars (often formed of a cluster of shafts bound together at intervals) take the place of the thick heavy Norman pillars; while the vaulting is much lighter, and there is a marked prevalence of vertical lines. Flying buttresses, bold, rounded mouldings, and crockets (ornaments resembling a shepherd's crook) are also among the characteristics of the style. The lancet-headed windows of the earliest examples are modified later on by the introduction of tracery, usually in the form of circles. The choir and apse of Westminster Abbey, much of Wells cathedral and the bishop's palace, the choir of Worcester cathedral and the Temple church, London, and the nave of Lincoln Cathedral are among the best-known examples of this style, but Salisbury cathedral is its leading type.

Earn. A river and loch of South Perthshire, Scotland. The loch is 26 miles W. of Perth, and is 7 miles long by $1\frac{1}{2}$ wide, and is 600 feet deep, and has picturesque scenery by reason of the high mountains which surround it. The river debouches from the east end of the lake, and flows through the beautiful and fertile Strathearn into the Tay, one mile below Abernethy, after a course of 46 miles. It is navigable for 4 miles. Salmon and trout are plentiful. Bridge of Earn is four miles S.E. of Perth.

Earring, an ornament hung from the ear, usually by a hook, which the lobe is pierced to receive. Occasionally in the East it has been worn singly, but usually both ears are ornamented. Their use is ancient and widespread. They were worn by the ancient Egyptian and Hebrew women as well as by those of Greece from the Homeric age downwards (the Venus of Medici has her ears pierced), while they have often been found in Norse and Anglo-Saxon tombs. In the East they are worn by both sexes. Foreign sailors occasionally affect them, and they are seen in one of Shakespeare's portraits. Popularly they are supposed to be good for the sight, presumably as counter-irritants when the eyes are at all inflamed. At present (1892) they are tending to go out of fashion.

Earth, the name given to that member of the solar system on which we live. Travelling periodically round the sun it is classed among the planets. Its orbit is therefore an ellipse, in accordance with Kepler's laws of planetary motion, with the sun at one focus of the curve. The plane containing this ellipse is called the *ecliptic*, shown by a great circle on the celestial sphere. Its speed depends upon the solar distance, being greatest when this distance is a minimum, and least when we are farthest from the sun. The average distance as estimated by observations on transits of Venus is 92,800,000 miles. A difference of over 3,000,000 miles exists between maximum and minimum solar distances, the positions of which are called aphelia and perihelia respectively. The average rate of motion is over 65,000 miles an hour, the whole

orbit being accomplished in one year. The elliptical orbit is subject to various perturbations (q.v.), on account of the attractions of the other heavenly bodies.

The earth has one satellite, the Moon (q.v.), which travels round the earth once a month in an elliptical path at an average distance of 238,000 miles. The exact length of the ordinary calendar year is 365 days 5h. 48m. 46s. This differs from the length of time taken for the orbit to be completely traversed, the difference being due to what is called the *precession of the equinoxes* (q.v.). This interval is known as the *sidereal* year, and is 365 days 6h. 9m. 9s. The earth's orbit is also gradually veering round towards the east, and if the time be taken from one perihelion to the next, the *anomalistic* year is obtained. This is about 365 days 6h. 13m. 48s.

Before giving the other motions of the earth, it is necessary to describe its shape. Like all other planets, it is a solid of revolution, being a sphere that has undergone a slight flattening at the opposite extremities or *poles* of the axis of revolution. More accurately, it is an oblate spheroid (q.v.), generated by the rotation of an ellipse about its minor axis. Such a figure would be assumed by a sphere of liquid rotating about a diameter, centrifugal force acting most vigorously at the equator, and tending to overcome the internal forces that keep the molecules together. The smallest diameter of the earth is that measured from pole to pole along the axis of rotation; this is 7,899·6 miles, or about 500,000,000 inches. The greatest diameters are those measured between opposite points on the equator; these are 7,926·6 miles, and, therefore, show that the *eccentricity* of the earth, or the extent of its departure from the perfect sphere, is very slight.

The circumference of the earth, measured along the equator, is 24,899 miles; the area is 197,000,000 square miles; and the volume is 260,000,000,000 cubic miles. Experiments on the comparative attraction of the earth [CAVENDISH EXPERIMENT] show that its density is about $5\frac{1}{2}$ times that of pure water at 4° C. Its mass is, therefore, approximately 6,000 trillion tons, a trillion being 10^{18}. (For ancient beliefs concerning the disposition of the earth and its neighbours, *see* PTOLEMAIC SYSTEM.) The ordinary proofs of the sphericity of the earth are—(1) It can be circumnavigated; (2) the appearance of a vessel at sea always indicates a nearer convexity of the earth's surface; (3) the sea-horizon is always depressed equally in all directions when viewed from an elevation; (4) the elevation of the pole-star increases as we travel northwards from the equator; (5) the shadow of the earth on the moon during a lunar eclipse is spherical.

The earth rotates uniformly about its axis. The time taken to make a complete revolution of 360° is called a *sidereal* day, for it is the interval of time between consecutive transits of any distant star across any meridian of the earth. The time between consecutive transits of the sun across any meridian is called a solar day; the average of these throughout the whole year is called a mean solar day, and is the practical standard of time (q.v.) adopted by civilised nations. The ordinary proofs that the earth rotates are—(1) Bodies falling from a great height have an easterly deviation; (2) Foucault's pendulum experiment (q.v.); (3) a gyroscope delicately balanced so as to be free to change the direction of its axis in any way will, if rotated, exhibit an apparent deviation; (4) in northern hemispheres a projectile deviates to the right, in southern hemispheres to the left; (5) the trade winds (q.v.); (6) Dove's law of wind-change (q.v.).

The speed of a body on the equator, due to the diurnal rotation, is about 1,000 miles an hour. The centrifugal force due to this speed diminishes the weight of bodies; if the earth rotated in an hour, they would be thrown off from the surface at the equator.

The axis of the earth is not perpendicular to the ecliptic, but at angle of 66° 32′ to it; the equator is, therefore, inclined to it at an angle of 23° 28′. This unsymmetrical placing of the bulging portions of the earth causes a slow wobbling, or *precession* (q.v.), of its axis, in the same sort of way as a spinning top will wobble when pushed over on one side. There is also a slight vibration or "nodding" motion of the earth's axis, known as *nutation* (q.v.). The period of each precession is about 21,000 years: if the earth's orbit occupied a constant position in its plane, the periods would be 26,000 years each. These motions have considerable influence on climate, the modern theories of the Ice Age being connected with the known facts of precessional motion.

The earth's temperature increases from the surface downwards at the rate of about 1° C. for every 100 feet of descent; this law does not hold for sea-depths, deep sea temperatures never exceeding 5° C. The phenomena of volcanoes, geysers, and earthquakes also point to a high internal temperature, and it is believed that the earth is gradually cooling down from a past condition of incandescence, more heat being lost from its surface every year by radiation than is received by the sun. It is probably solid throughout, the extreme internal pressure preventing liquefaction or vaporisation until restraint is removed and some outlet afforded. In fact, the rigidity of the earth must be comparable to that of steel in order to withstand with so little distortion the various gravitational and other stresses to which it is subjected.

Only the 2,000-millionth part of the sun's heat reaches the earth, and part is immediately reflected back into space. Seasons (q.v.) are due to variation in the obliquity of the sun's rays during the year, and to variation of its distance from the earth. Climate undoubtedly depends also on the lengths of summer and winter, using these terms to denote the two portions of the year into which it is divided by the equinoxes (q.v.). It must be understood that any hemisphere of the earth receives half the solar heat that arrives during a year. The summer in the northern hemisphere will, therefore, happen at the same time as the winter in the southern hemisphere, and conversely. It has been proved that so long as the obliquity of the ecliptic remains at its present value, of the total heat received from the sun in one year on a hemisphere, 63 per cent. is received during the summer and 37 per cent. in the winter. This is the case whatever be the shape of the earth's orbit

or the position of the line of equinoxes. But this line alters the number of days in summer and winter, and its position will, therefore, affect the intensity of heat distribution during the summer or winter-days. The 37 per cent. winter-supply distributed over a long winter of 199 days is what obtains during the glacial epochs of the earth's history; whereas the 37 per cent. distributed over a short winter of 166 days is the case during the general epochs. At present the northern hemisphere is in an intermediate condition, its winter being of 179 days.

(Concerning the gaseous envelope of the earth, *see* ATMOSPHERE.)

Earth Houses, the general name for curious pre-historic structures, found chiefly in Scotland, but occurring also in Ireland and in Cornwall, whence their Celtic origin has been inferred. The general plan is a curved subterranean gallery, in some cases more than 60 feet long, widening from the opening, and sometimes chambered. The walls are lined with dry masonry, converging towards the top, which is covered in with large unhewn slabs, these being but little below the surface and often uncovered by the plough. Some of these structures, from the relics found in them, appear to have been occupied down to the period immediately after the Romans quitted Scotland. They may have been receptacles for plunder, or places of shelter from the inclemency of the weather before houses were built, or of concealment from an enemy. It is noteworthy that Tacitus (*Germania*, xvi.) describes somewhat similar structures as existing among the Germans.

Earthquake, a sensible tremor of the earth's surface as if from a concussion at some definite underground centre. Earthquakes are the subject of the science of *seismology* (from the Greek *sĕismŏs*, an earthquake), the earliest English work on which is *Hooke's Discourse on Earthquakes*, 1668. Attention was more directed to the subject by the Lisbon earthquake of 1755; but little is even yet known as to the cause of the phenomena.

Probably several distinct causes bring about similar results. Most earthquakes occur in proximity to volcanic centres, and most volcanic eruptions are preceded by earthquake shocks, suggesting a community of origin for the two sets of phenomena. The sudden flashing of percolating water into steam on reaching highly-heated rocks, is proposed as a sufficient cause for both. Landslips produce tremors in non-volcanic areas resembling earthquakes, and the falling-in of the roofs of subterranean cavities has also been suggested as a cause, but is only likely to affect a small area. The sudden snap and dislocation of rock-masses under pressure producing a "fault" (q.v.), or the crushing together of such masses under the tangential pressures produced by the secular cooling of the globe, are suggestions of wider-reaching causes.

Professor Alexis Perrey of Dijon finds earthquake shocks more numerous about the winter solstice, *i.e.* when we are in perihelion, at apogee, and when the moon is on the meridian, suggesting their connection with a tidal action on the earth's interior.

The centre of origin of the concussion, whatever it be, is known as the *seismic centre* or *focus*, a point on the earth's surface vertically above it (where the shock will be first and generally most severely felt), being termed the *epicentrum*, whilst the line joining them, the length of which is the depth of origin of the concussion, is called the *seismic vertical*.

The so-called shock is in reality the culminating of several undulatory movements of increasing intensity, and is followed by a diminishing series. These shocks consist in successive "waves of elastic compression" transmitted through the solid earth, much as sound is transmitted through the air. In addition to the "longitudinal vibrations," or forward and backward movement of rock-particles in the direction of the transmission of the shock, there are "transverse vibrations," which tend to make the effects more complex, as, for instance, in rotating chimney-stacks without overturning them. The actual distance through which individual particles oscillate, the amplitude, that is, of the undulation, in spite of the enormously destructive effects of some earthquakes, is probably generally less than an inch. The rate of transmission of the shock depends upon the density and elasticity of the various rocks, etc., through which it passes. Mr. Robert Mallet, the first of our modern seismologists, and his son, Dr. J. W. Mallet, determined by experiments with gunpowder explosions that such shocks travelled through damp sand at a velocity of about 825 feet per second, and through solid granite at 1,665 feet per second. The shock seems to undergo partial reflection, and perhaps refraction, in passing from one medium to another of differing elasticity, as from one geological formation to another, from land to water, or *vice versâ*. This may result in a local doubling of the effects by the reflected wave, and in the formation of an area of *seismic shadow* enjoying relative or complete immunity from harm. The points at which a wave-shell reaches the surface form a curve called a *co-seismal line*, along which the shock is felt simultaneously; but, owing to the varying conductivity of the heteregeneous materials of the earth's crust, this curve is not a circle, in other words the wave-shells are not concentric spheres, and the *co-seismic points* are not equidistant from the epicentrum.

The earthquake produces an atmospheric wave which will travel at the ordinary velocity of sound-waves, viz. 1,100 feet per second. It has often been recorded as a rumbling noise like thunder or cannon. On reaching the sea or other large body of water the shock produces two waves: one slight one, travelling with the earth-wave along the bottom; the other, with less velocity and of a height dependent on the depth of the water, rolling in after the earth-wave, often with most fatal effect, as at Lisbon in November, 1775, and at Arica, in Peru, in August, 1868, and in May, 1877.

Mr. Mallet was of opinion that the *angle of emergence* of the shock could be ascertained from cracks in masonry, the general direction of which might be expected to be at right angles to the direction of transmission; but, apart from

such difficulties as the zigzag character of most of such cracks and the manifestation of pre-existent weaknesses in the structures, the transverse vibrations have been proved to render all such conclusions untrustworthy. Could we determine the angle of emergence, knowing our distance from the epicentrum, it would be easy to calculate the depth of the focus, and Mr. Mallet was of opinion that this was not likely to exceed 30 miles.

Besides overthrowing buildings, earthquakes frequently produce landslips (q.v.) or subsidences, alter lines of drainage, and affect springs. Only occasionally do fissures open; but they may engulf houses and human beings, or, remaining open, may be widened by other agencies into ravines.

The area affected by earthquake is very variable. That of Lisbon was felt over a region four times the area of Europe, Lake Ladoga and Loch Lomond rising and falling, the springs at Töplitz and at Bristol being affected, and that at Luchon in the Pyrenees becoming permanently warmer. The Arica earthquake was felt 2,000 miles off; but, on the other hand, destructive shocks on the islands of Casamicciola in the Bay of Naples, and Scios in the Archipelago, were hardly noticeable on the mainland.

Various *seismometers* and *seismographs*, or instruments for recording the duration, direction, and intensity of earthquake shocks have been devised. Mallet suggested a tub rubbed over with chalk inside and half filled with water. In Italy a vessel containing mercury is employed, eight openings, with cups to receive overflow, being disposed round its margin. A suspended helix of copper wire may, on dipping into the mercury, complete a galvanic circuit, ringing an alarm-bell, stopping a clock to indicate the commencement of the shock, and starting another so as to indicate its duration. Another instrument consists of two rows of wooden cylinders of equal height, but different in diameter, arranged on two planks at right angles to one another on a surface of sand, to prevent their rolling when overturned. Other instruments consist of pendula vibrating in different planes over bowls lined with chalk or lamp-black, and much valuable information as to the direction of earthquake shocks may be obtained by merely noting the orientation of pendulum-clocks which may happen to be stopped by the shock striking them obliquely to their plane of vibration. Unfortunately, careful observations made in Japan, where earthquakes are frequent, have yielded most contradictory results.

Earths. The early alchemists recognised four "essences" or "elements." Of these *earth* was one. The term "element" had not, however, the same definite meaning then that it obtained amongst chemists of later times. The name was afterwards applied to such substances as were unacted upon by heat or by water. Since lime and other kindred bodies showed great resemblance to the ordinarily known earths, they also received the same title, but as they gave a basic solution in water they were distinguished as "alkaline earths." These were shown to consist of oxides of metals, and, although many of the substances previously called earths do not fall in this class of bodies, the term was restricted to infusible, insoluble oxides. At the present time the word is not of great usage in chemical literature, being applied to the oxides of certain metals which, though some occur plentifully, as calcium, barium, aluminium, are for the most part found in but small quantities, as cerium, lanthanum, iridium.

Earthworks, in *Engineering*, is a term applied to cuttings or to embankments; to the removal of earth as in the cases of canals, trenches, docks, or railway cuttings, or to the systematic deposition of the same, as in the cases of earth-dams, elevated canals, or railway embankments. The general methods of executing earthwork are similar in most applications of the work. In the formation of a railway over irregular ground, the elevation is usually chosen so that the amount of cutting shall be approximately equal to the amount of embankment, the earth obtained from the former being conveniently discharged where required for the latter. The work is proceeded with continuously, the full height of the railway at any one place being reached before the further excavation or embankment is begun. This renders the laying-down of rails convenient, and the material can therefore be easily shifted in waggons, etc. Steam excavators are much used, and their transit from place to place requires the rails. The angle of slope of a cutting for embankment depends upon the nature of the ground. Chalk may be at a very steep angle or *batter*, but a moist, loose, gravel soil requires an easy slope, the angle of repose (q.v.) of that material being so small. Continual vibration, such as that produced by passing railway trains, may in course of time affect their stability, as also may inefficient drainage, or alternation of extremes of temperature. The amount of earthwork of any such undertaking requires careful calculation, but in the case of those with the ordinary trapezoidal section the estimation is easy. The sectional area is then obtained by multiplying the depth of the section by the average of the top and bottom widths; the cubic contents of any length of such an earthwork is the product of that length and the sectional area.

Earthworm. The common earthworm, *Lumbricus terrestris*, is a very convenient type to serve as an introduction to the study of the worms, as its anatomical structure is fairly easily made out by dissection, and it is so extremely common. It belongs to the class Oligochæta (q.v.). When examined externally, the earthworm is seen to consist of a long cylindrical body, divided into from 100 to 200 cylindrical rings or segments by means of well-marked furrows. The mouth opens on the second of these rings, and the segment in front of it is a small conical point known as the "prostomium"; the anus is situated at the extreme posterior end. The body tapers sharply to a point at the anterior end and more gradually posteriorly; the rest of the body is of a uniform diameter except for segments numbers 31 to 38, counting from the front end; these are expanded by a number of glands into a region known as the "clitellum," the function of which is the formation

of the cocoon by which the eggs are united into masses. Running along each side of the ventral aspect of the worm is a pair of faint raised lines; on each of these during its passage across a segment a pair of small bristles or setæ occur; these are very fine, and are often lost; they represent the strong conspicuous setæ of the Polychæta (q.v.). If the earthworm be cut open, the dorsal side of the body cavity will be found to be divided into a number of separate chambers by vertical partitions or dissepiments, which correspond in position to the depressions which mark off the somites. The digestive system consists of one long tube running straight from the mouth to the anus; immediately behind the mouth it expands out into a large "pharynx," occurring in the first five somites; this is continued as a narrow tube, the œsophagus, which dilates into the crop in the 16th and 17th somites; behind this occurs the gizzard, and then comes the long straight simple intestine; as this is straight, instead of convoluted, additional internal digestive and absorbent surface is obtained by an infolding of the upper side of the wall, known as the "typhlosole." There is no distinct heart in the earthworm, but there is a complex series of blood vessels. The largest of these is the "dorsal," and runs along the upper side of the alimentary canal; it is connected by numerous lateral vessels with smaller longitudinal canals on the under side. The nervous system consists of a distinct "ganglion" above the mouth; a pair of lateral nerves pass from this one on each side of the pharynx, and unite below in a pair of ganglia in the second somite; thence a long cord passes backward through the length of the worm on the under side; in each segment it expands out into a distinct ganglion. The renal organs or "nephridia" occur as a pair in each somite in all except the first three. One end is a funnel, on the margin of which occur long lashing cilia; this funnel floats freely in the fluid which fills the body chambers; it leads into a long narrow tube which passes through the diaphragm between the two somites, and opens to the exterior in the next posterior somite. The reproductive organs are included in the 10th to 15th somites; the earthworms are hermaphrodite, male and female organs occurring in the same individual. Organs of special sense are very imperfectly developed; earthworms are blind, but can distinguish between light and darkness; they are also completely deaf, and have but a feeble sense of smell. Their sense of touch is, however, very well developed. Earthworms live, as a rule, burrowing through mould and soil containing much decaying vegetable matter. They carry leaves into their burrows, prepare these for food by covering them with a saliva, which partly digests them before they are actually eaten (extra-stomachal digestion). The main food of the earthworms is, however, obtained from the soil through which they burrow; the earth removed is swallowed, the organic matter in it is absorbed, and the excreta discharged, forming the casts found about the entrances to worm burrows. The earthworm thus constantly raises parts of the soil to the surface; in suitable soil they exist in great numbers. Hensen calculated the number at over 50,000 an acre. The influence of worms in rearranging the soil is very considerable; as has been observed, they carry down leaves to line their burrows, and thus act as fertilising agents; by gradually removing the soil from under stones, etc., and piling it up around them, they ultimately bury and preserve them. The part played by earthworms is thus an exceedingly important one. In some tropical districts where the soil is unsuited for worms, the white ants (*Termites*) play their part.

Earwigs, a family of Orthoptera (q.v.), known as the *Forficulidæ*, of which *Forficula auricularis* (L.) is the commonest English species. The popular name is derived from the fact that specimens have at times managed to get into the ear. The eggs are watched with great care by the parents. The earwigs live mainly on plants and flowers.

Easement. An Easement is the right which the owner of one piece of land, technically called the dominant land, has in respect of his ownership, by virtue of which right the owner of another piece of land, technically termed the servient land, is necessitated to allow the owner of the dominant land to do something on the servient land, or something which has relation to that land, or is himself obliged not to do something on that land, and this power possessed by the owner of the dominant land or this duty to forbear on the part of the owner of the servient land, must be something that is for the benefit of the owner of the dominant land. Easements are very numerous, and are classed as public and private; they are principally the right to air, light, common, water, and passage. By the "Prescription Act" passed in the second and third years of the reign of William IV. (2 and 3 William IV. c. 71), an uninterrupted enjoyment of rights of common and all other profits or benefits to be taken and enjoyed from or upon any land for 30 years shall not be defeated except by showing that it was without the knowledge of the adverse party, or that it was by his mere licence or permission, and after an enjoyment of 60 years the claim is indefeasible, except it can be shown that such enjoyment was under consent or agreement in writing.

Eastbourne, a municipal borough town and parish on the south coast of Sussex, between Brighton and Hastings, and 66 miles S. of London. It has lately become a highly fashionable watering place, and the landowners and local authorities have done much towards improving, beautifying, and developing it. It has the benefit of shelter, while a short walk enables one to get the invigorating breezes of the South Downs, and on the other side of the Downs may be found charming scenery. Close by is Beachy Head, with its lighthouse and lofty cliffs. The town has broad streets, and is well furnished with trees, and on the sea-front is a parade of two miles, with three tiers of terraces ornamented with plants. There is a theatre, and the golfers have links. Roman remains have been found, and the place is mentioned in Domesday. There is an interesting twelfth-century church. The town was made a borough in 1883.

East Cape, the name of several capes, among them being those in New Guinea, Madagascar, New

Zealand, and Siberia—the last, on Behring's Straits, being the east point of Asia.

Easter, derived by Bede from the name of an Anglo-Saxon goddess Eostre or Eastre, the personification seemingly of the dawn, whose festival fell on the vernal equinox; by others, with less probability, from the Anglo-Saxon *oster*, to rise; the chief festival of the Christian Church, commemorating the resurrection of Christ. Part of the ceremonies of the heathen festival lasted on in the Celtic celebrations of Beltane; and the Easter egg, symbolising life out of death, had probably a naturalistic before it had a theological meaning. All the other Church festivals are fixed by the date of Easter, which is determined in a manner to be found in the tables prefixed to the Anglican Prayer-Book, and based on the Metonic cycle. In the early Church the method of its determination caused much controversy. Some kept it on the traditional anniversary of the Resurrection, *i.e.* on a different day of the week in successive years; others on the fourteenth day of the first moon in the year, which began in March—these were called Quartodecimans; others on the first Sunday after the first full moon in the year. The authority of St. Philip and St. John was alleged for the second method, which was adopted by the Eastern Church; that of St. Peter and St. Paul for the third. The Quartodecimans adopted Jewish practices, which were regarded as heretical; and a bitter controversy arose, which was settled by the decision of the Council of Nicæa in 325 A.D., that Easter should fall on the first Sunday after the first full moon on or after March 21. It cannot, therefore, fall before March 21 or after April 25. The name is often extended to the customary holidays before and after the day. The inconvenience resulting from their fluctuation has led to the cry for a "fixed Easter."

Easter Island, in the Pacific, in lat. 27° S. and long. 109° W., is a volcanic island of 47 square miles. It is remarkable as having some stone houses and stone statues of peculiar appearance, with inscriptions as yet undeciphered, which seem to indicate a degree of very ancient civilisation. It derives its name from the fact of its discovery upon Easter Day, 1722. It was visited by Captain Cook in 1773.

Eastern Question, in European politics, primarily, the question of the fate of the dominions of the Sublime Porte after the fall of that power. Though the Turkish Empire was considerably encroached on by Russia and Austria in the 18th century, the modern Eastern Question may be said to date from the battle of Navarino (q.v.) in 1827 and the conflict between Turkey and Mehemet Ali, the Viceroy of Egypt, in 1833, during which Russia and Turkey bound themselves in the treaty of Unkiar Skelessi (July, 1833) to a close mutual alliance—Russia, however, binding herself not to make any present demand for aid to Turkey, and the Porte in return undertaking to close the Dardanelles, should Russia be at war, to ships of all other nations. This treaty was set aside, however, through the intervention of the Western Powers. In 1844 the Czar Nicholas visited England to sound Ministers as to what was to be done, seeing that, in his own phrase, the Porte was "a sick man who cannot live long." In 1853, on the occasion of the disturbances in connection with the Holy Places which led to the Crimean War (q.v.), he suggested a partition of Turkey. The formal restoration of Turkish power by the Treaty of Paris (1858) after the Crimean War unfortunately kept the question open. Among the chief crises in the history of the question since 1859 are:—the union of the Danubian principalities in 1859; the occupation of the Lebanon by France in 1860; the rising in Crete (1864–66); the "tearing up of the Black Sea Treaty" (preventing Russia from maintaining warships there) by that power in 1870, during the Franco-German war; the Russo-Turkish war in 1876–78; the Treaty of Berlin in 1878; the union of Bulgaria and Eastern Roumelia (1885); the fall of Prince Ferdinand (1886), and the threatened war between Greece and Turkey in the same year, stopped by the blockade of Greek ports by the Western Powers. From the time of the Crimean war the question has become complicated with the alleged designs of Russia on the British Empire in India and her progress in Central Asia.

East India Company, The, was founded in 1600, and obtained a charter from Queen Elizabeth, granting it exclusive rights of trade between England and the East. In 1612 it established its first factory at Surat, the starting-point of pilgrims going to Mecca, and an important outlet of the trade of Western India. The "factory" was composed of English traders and clerks, living together, attended to spiritually by an English chaplain, and administered by a president, assisted by some of the leading traders as a council. Hence the "Presidencies" and Councils of the present Government of India. No ladies were permitted in the factory. The Company were much hampered in India at first by the Portuguese, and always, farther East, by the Dutch. In 1620, however, they obtained a footing at Masulipatam; they repelled a Portuguese attack on Surat, and so impressed the Great Mogul; in 1639 they purchased a strip of ground, and built Fort St. George, round which a native industrial population grew up, the nucleus of the present Madras; in 1665 the Surat factory was moved to Bombay, obtained by the Crown as part of the dowry of Catherine of Braganza, and leased to the Company. In 1640 a factory had been established at Hughly, about twenty miles above Calcutta, an important outlet for linen, saltpetre, and silk. This, in 1685, was moved to the present Calcutta, where the sites of some native villages were purchased from the Nawab of Bengal. The Company had to some extent purchased its privileges by gifts to the Crown—thus it helped Charles I. to raise £60,000 for war purposes—and gave presents, though not of large amount, to Charles II. and James II. The right of making war on its own account was granted to it by the former king. The abolition of its monopoly, threatened by Cromwell, was voted by both Houses in 1693, but the disclosures of the bribery by which it had attempted to avert this step were so scandalous that Parliament was hastily prorogued to stop further revelations. In 1698, however, a

rival company was established, but the two were amalgamated in 1708 as the "United Company of Merchants trading to the East Indies," with a capital of £3,200,000, lent to the Government at 5 per cent. For the last half of the 18th century it was but little in conflict with the natives; the enterprise of Dupleix (q.v.), governor of Pondicherry, nearly destroyed its rule. But it was saved by Clive (q.v.) in 1750–52, and Dupleix, repudiated by his government, died in poverty. From Clive's time onward this trading company is gradually converted into the deputy-ruler of India, and the histories of the two are difficult to separate. We find that the Company interferes in the affairs and feuds of native princes; sets its own candidates on native thrones; steps into the place of the native administrators of their dominions, with their consent—thus, in 1765, it became Dewan to the Great Mogul, taking the revenues of Bengal, Berar, and Orissa, and providing for the defence of the provinces, and it took the place of the Great Mogul (in 1771) when he joined the Mahrattas, and so forfeited his suzerainty and the pension paid him by the English Government) as suzerain of feudatory states. The Company, however, as Adam Smith said, "had two incompatible characters—that of trader and that of sovereign." As sovereign, its business was to increase the wealth of the country; as trader, to get that wealth as cheaply as possible. Moreover the officials were corrupt, and traded largely on their own account, and interfered with native production in their own interest. Lord Clive abolished the private trade. [HASTINGS.] In 1783 Fox's India Bill, introduced in consequence of charges of maladministration brought against the Company, proposed to abolish the Court of Directors of the Company, transferring their power and patronage to seven commissioners nominated by Parliament. George III., to increase his own power, was anxious to nominate these commissioners, and, failing to secure this power, put pressure on the House of Lords, and induced it to reject the bill. Under Pitt's India Act in 1784, Parliament controlled the whole administration of the East Indian Empire, a Board of Control was appointed by Parliament, a Governor-General by the Crown, and, while the East India Company made all first nominations in its Civil Service and its army, promotion in India was left to the local governments or to the Governor-General in Council. In 1813 the Company lost its privilege of exclusive trade with India, in 1833 all its monopolies, and the country was thrown open to Europeans without (as hitherto) the requirement of a licence from the Board of Directors. The Governor-General of Bengal was made Governor-General of India, with increased control over Madras and Bombay, and a legal member added to the Council. In 1853 Parliament refused to renew the charter of 1833, which then expired, introduced open competition for first appointments, and gave a representative character to the Legislative Council. Finally, in July, 1858, after the Mutiny, India was transferred to the Crown by Act of Parliament, though the Company existed till 1873 as a medium for the distribution of stock. J. S. Mill strongly opposed the transfer.

East Indies, a name given generally to denote European possessions in India and the Indian Ocean. There are English, French, Dutch, and other East Indies.

Eastlake, CHARLES, SIR, P.R.A. (1793–1865), was born at Plymouth. He studied at London and Paris, and after making two portraits of Napoleon when on board the *Bellerophon*, he lived from 1816 to 1830 in Rome. He became A.R.A. in 1827 and R.A. in 1830, and president in 1850, receiving at the same time the compliment of knighthood. In 1855 he became director of the National Gallery, London. His *Christ Blessing Little Children*, and *Christ Weeping over Jerusalem*, are in the National Gallery. He also wrote upon art, among his works being *Materials for a History of Oil-Painting*.

East London, a town of South Africa, at the mouth of Buffalo river, 32 miles S.E. of King William's Town, and 700 E. of Cape Town. There are harbour works in progress, and the town is an outlet and inlet for the district, being the terminus of a railway to Queenstown.

East Main, in Canada, in the N.W., forms great part of the peninsula of Labrador, having on the E. Labrador proper, on the S. the province of Quebec, on the N. Hudson's Strait, and on the W. Hudson's Bay. It is desolate and wild, and produces little beside fish and furs.

East Saginaw, a town of Michigan, 66 miles N.E. of Lansing, and the chief port of the steam navigation upon Saginaw river, which is crossed by several bridges. There are planing- and saw-mills, foundries, machine shops, and shipbuilding yards, and there is a trade in timber.

Eastwick, EDWARD BACKHOUSE (1814–1883), a man of letters, was born in Berkshire, and educated at Charterhouse and Oxford. He went to India as a cadet in 1836, and was soon after appointed political officer. He was Professor of Hindustani at Haileybury College (1845–49), and then became assistant political secretary at the India Office. From 1860–63 he was Secretary of Legation in Persia. He made many translations from Persian, and also translated Bopp's *Comparative Grammar*, and Schiller's *Revolt of the Netherlands*.

Eau de Cologne, a perfume named from the city where first manufactured, is an alcoholic solution of various essential oils, of which the chief are the oils of citron, bergamot, and lavender. The purity of the materials is most important in its preparation, as upon this depends chiefly the fragrance of the perfume.

Eau de Javelle, a solution containing the hypochlorite and chloride of potash, which is prepared by passing chlorine into a solution of potash or into lime-water, and the subsequent addition of potassium carbonate. Owing to the chlorine which is evolved on the addition of a weak acid the liquid may be used for bleaching and disinfecting.

Ebbw Vale, a valley of North Monmouthshire, on the Ebbw Fawr river, 21 miles N.W. of Newport, producing iron and coal. The Ebbw Vale Iron and Coal Company, besides exporting much coal, have

four blast furnaces turning out 1,600 tons a week, and manufacture steel rails and railway iron.

Ebers, GEORG, born at Berlin (1837), a renowned Egyptologist. After studying the subject and visiting most of the European museums, proceeded to the East in 1869, and was appointed the next year Professor of Egyptology at Leipzig. In 1875 he published a papyrus which he had discovered, and which was named after him. He had already published one volume of a work upon the Egyptians and the Book of Moses, and other works, but illness stopped his more serious work, and he then occupied himself in writing novels.

Ebionites (possibly from the name of their alleged founder, more probably from a Hebrew word = *poor*), a sect of Judaisers in the early Christian Church, described by Zeller as "the Christian successors of the Essenes, who practised Jewish rights, used unleavened bread in their mysteries, repudiated the authority of St. Paul, and denied the divinity of Christ." Their creed shows traces of the dualism common to many pagan and early Christian schools of thought. Gradually they became absorbed in the obscurer Gnostic sects of the 2nd century.

Eblis, the devil of Moslem theology. When God "said unto the angels, Worship Adam, they all worshipped him, except Eblis, who refused, and was puffed up with pride, and became of the number of the unbelievers" (*Koran*, ch. ii.).

Ebonite is formed by the incorporation of sulphur with twice its weight of caoutchouc by means of heat and pressure. As it is hard and takes a high polish it is much used for manufacture of combs, buttons, and other articles, and owing to the fact that it is easily electrified, and a poor conductor of electricity, it is also largely used in the manufacture of electrical apparatus.

Ebony, the heavy and hard heart-wood of various species of *Diospyros*, a genus of the order *Ebenaceæ*, which is either black or brown, durable, and susceptible of polish. The order includes five genera, and about 250 species, upwards of 100 of which belong to the genus Diospyros. These are mostly natives of tropical Asia, Mauritius, etc., three or four only being African, and about a dozen American. They are trees with dicœcious flowers, and fleshy, sometimes edible fruit. The best black ebony is that of *D. reticulata* of Mauritius. East Indian ebony is *D. melanoxylon* and *D. ebenaster*: Ceylon, *D. ebenum*. The hard, heavy, greenish-brown wood of the shrubby leguminous *Brya ebenus* of the West Indies is known as Jamaica or green ebony. Ebony is used in cabinet-work, inlaying, for knife-handles, rulers, pianoforte-keys, etc., and was valued for its durability by the ancients, and as a supposed antidote to poison. *D. quæsita* yields the mottled brown and black Calamander wood of Ceylon: the fruit of *D. kaki* is the kaki, keg-plum, or Chinese date-plum of China and Japan; and that of *D. virginiana*, the persimon of Virginia and the southern United States.

Ebro, THE (anciently the *Iberus*), the chief river of Spain, rises in the province of Santander in the Cantabrian Mountains, and flows S.E. through Old Castile, Navarre, Aragon, and Catalonia, falling into the Mediterranean, after a course of more than 300 miles, 80 miles S.W. of Barcelona. Although navigable for 180 miles from the mouth, its course is obstructed by rapids and shallows, to avoid which a canal has been made for nearly 100 miles along the bank, and there is another canal through the delta. The Ebro receives several tributaries.

Ebullition, or BOILING, signifies the free passage of the particles of a liquid upwards from its free surface level into the space above. It can only occur when the temperature of the liquid is such that the particles exert sufficient pressure to overcome the superincumbent gaseous pressure, and so pass freely from one side to the other of the surface level. For every given external pressure on unit area of the liquid, there is a corresponding temperature of ebullition or *boiling-point*. But it must be understood that a certain amount of diffusion of the water-particles may take place even when their pressure is insufficient to allow perfectly free passage from the liquid to the gaseous condition. This diffusion is called *evaporation* (q.v.); it is identical with ebullition only when the vapour pressure is equal to that special pressure of the liquid that corresponds to the given temperature. Thus evaporation of a liquid in contact only with its own vapour is really ebullition, and the vapour is then said to be at *dew-point* (q.v.), or to be *saturated*.

Écarté (French *écarter*, to discard), a game of cards originating in Paris early in this century, but said to be based on an old French game, called *triomphe*. It is played by two persons with a pack from which the small cards (the two to the six inclusive of each suit) are taken. The king counts highest, the ace between the knave and the ten. The dealer gives five cards to his adversary and five to himself, turning up the eleventh as trumps, and then, if dissatisfied with his hand, may "propose" to discard (whence the name). Should the proposal be accepted, each player, without showing his cards, discards as many of them as he pleases, drawing an equal number from those yet undealt. The dealer then leads, the adversary follows, and two cards form a trick. The game is five up. The rules as to trumping, following suit, and taking tricks are like those in whist, except as to the values of the king and ace. There are standard rules approved by the Turf Club.

Ecbatana (a word which is taken to mean *treasury*) is the name of several towns of antiquity. Of these the most important is the old capital of Media, said to have been built by Seleucus. Its position is doubtful, but Deioces is said to have had here a wondrous palace surrounded by seven walls, the different battlements of which were each of a different colour. According to the biblical account it was the chief seat of Cyrus, and it appears to have been as favourite a residence of the Persian as of the Median kings. The palace existed in the time of Josephus.

Ecce Homo (Lat. Behold the Man!) a title

of pictures of Christ suggested by Pilate's saying (John xix. 5). The best known is by Correggio. Also the title of a book, attributed to Professor Seeley of Cambridge, which made considerable stir in England on its publication (1865), partly from its ability, partly from its alleged heretical tendencies.

Eccentric, in machinery, a contrivance for converting the rotating motion of a shaft into an oscillatory straight-line motion. It is in very general use for working the steam-valves of engines. It consists of a circular disc fitted on to the rotating shaft in such a way that it is perpendicular to the axis of the shaft without this axis passing through the centre of the disc. Thus its motion is ex-centric, the centre of the disc describing a small circle around the axis of the shaft. Round the edge of the disc is fitted a metal ring or strap, to which is rigidly fixed the eccentric-rod. The farther end of this rod is constrained to move in a straight line, and therefore has a backward and forward motion in that line imparted to it. The eccentric may, therefore, be regarded as a special kind of crank; the disc corresponds to the crank-pin, though considerably enlarged; the eccentric-rod corresponds to the connecting-rod, the strap to the sleeve that fits on the ordinary crank-pin.

Ecchymosis. If the capillaries of the skin be damaged by bruising or in certain forms of disease [PURPURA], an extravasation of blood occurs, which if limited in extent is called an ecchymosis (from two Greek words, *ck*, out, and *chymos*, juice). If the escape of blood be so considerable as to give rise to pronounced swelling the condition is spoken of as hæmatoma.

Ecclefechan, a town of Dumfriesshire, 20 miles N.W. of Carlisle, noted as the birthplace of Thomas Carlyle, who was also buried here by the side of his father and mother. He mentions the place, under a pseudonym, in *Sartor Resartus*.

Ecclesfield, a township in the West Riding of Yorkshire, six miles N. of Sheffield. Its chief industries are the manufacture of cutlery, linen, paper, and nails, and there are coal and iron mines in the neighbourhood.

Ecclesia (Greek, an assembly; from *ekkalĕo*, to summon), the name of the citizen body in Athens and other Greek democracies summoned to transact public business. In early Christian times it was applied to the Church, the body of believers called out from the world by God. In the Romance languages the name for Church is usually derived from it.

Ecclesiastes, or THE PREACHER (*cf.* i. 1, 12) (the title is a translation of the Greek title *Koheleth*, which probably means one who calls an assembly), a poetical book of the Bible, attributed to Solomon by Jewish and ecclesiastical tradition—as well as by some modern critics. Chapter ii. and other passages, indeed, seem distinctly to assert his authorship, though some ancient Jewish critics believed that the work had been edited after the reign of Hezekiah. But it is now very generally believed to be much later than the Captivity, even by orthodox critics (*e.g.* Delitzsch), partly on the ground of its language, which appears very late in vocabulary and grammar, and contains Aramaisms; partly from some of its alleged allusions to contemporary history (*e.g.* iv. 13, v. 8, x. 16), which are thought to point to the misrule during either the Persian or Macedonian supremacy, and partly from certain alleged affinities to Greek philosophy, Epicureanism (*e.g.* ii. 21), the doctrine of the highest good (ii. 3), and the Stoic doctrine of cyclic progress (iii.). But the significance of these allusions, especially the last-named, has been much disputed. On the strength of this internal evidence various dates have been assigned to it, ranging from shortly after the return from the Captivity to the reign of Herod the Great. There is almost as much variety in the ideas of commentators regarding its plan and scope. The author gives his own experience of life, which in a certain sense has left him a pessimist. He has found that wisdom and knowledge, luxury and power, are all alike vanity; men are subject to the inscrutable law of God, who gives to each as He wills. And the author decides for submission to the law of God (xii. 13 and iii. *passim*), the life of righteousness, and the acceptance of the calm happiness of ordinary simple human life (iii. 12, v. 18, xi. 9). Perhaps this is vindicated against the growing strictness that culminates in Pharisaism (*cf.* vii. 16). But there are sceptical and pessimistic passages, and critics have found several inconsistencies of thought. Again: while some critics have detected an elaborate arrangement of the poem in strophe and antistrophe, others have thought the work unfinished and edited after the writer's death, partly from his rough notes; and passages have, it is maintained, been modified to suit the needs of Jewish orthodoxy. There seems to be a considerable element in the book of the proverbial wisdom which is embodied in Proverbs and Ecclesiasticus. There is little doubt that the writer lived in Palestine, and was familiar with the Temple worship. Orthodox critics dispute the significance of the alleged allusions to the post-exilic period and to Greek thought, and assert that the peculiarities of the language are the effect of Solomon's intercourse with his foreign wives. The opening and closing portions especially are of great poetic beauty and dignity. The genuineness of the last chapter is much debated. The canonicity of the work was disputed between the Jewish schools of Hillel and Shammai, and was not agreed upon till after the destruction of Jerusalem. Luther wrote a commentary on it, and the works dealing with it are very numerous. Of recent commentaries those of De Ginsburg, Dr. C. H. H. Wright, Dean Plumptre, and Mr. T. Tyler may be mentioned. The latter has attempted to show the influence of Greek philosophy. M. Renan has also written a somewhat flippant and unsympathetic treatise on the book.

Ecclesiastical Commissioners are a body of persons, constituted under statutes passed during the present reign for the general management and supervision of the Estates of the Church, being either episcopal or capitular, and for the proper

application of the revenues or produce thereof in support and extension of the Church.

Ecclesiastical Courts are Courts having only spiritual jurisdiction—that is, jurisdiction in ecclesiastical matters and in which the Canon Law is administered. [CANON LAW.] They are:—(1) The two principal Courts of Canterbury and York; (2) The Court of Arches; (3) The Diocesan Courts of each Diocese [ARCHES, ARCHDEACON]: also several other courts which have either become obsolete or are not strictly judicial tribunals—such as the Court of the Vicar-General and that of the Master of the Faculties. [VICAR-GENERAL, FACULTIES.] The Privy Council is the supreme Court of Appeal in Ecclesiastical matters. A large department of what was formerly ecclesiastical business—*e.g.* the granting of Probate of Wills and Administration—has now been swept away by the establishment of the Court of Probate. [PRIVY COUNCIL, PROBATE.] In Scotland the analogous institutions are the Kirk Sessions—Presbyteries, Synods, and General Assemblies. Dissenting bodies have both in England and Scotland courts or councils of their own.

Ecclesiasticus (Greek, the Church Book, from its frequent use in the services of the early Christian Church), the oldest of the Apocryphal books of the Old Testament [APOCRYPHA], and called by its author *The Wisdom of Jesus the son of Sirach*. From his preface we learn that it was written by one Jesus or Jeshua, in the Hebrew (probably not the Aramaic) language, and translated by his grandson, Jesus, the son of Sirach, whose name it bears, "in the thirty-eighth year of Ptolemy Euergetes." This rendering, however, is disputed. There are two kings of this name; and it mentions, also, apparently as nearly contemporary, a certain Simon the High Priest, the son of Onias, who repaired the fortifications of Jerusalem. But there are two kings and five high priests who bore the names. The Simon mentioned is identified with either the first (310–290) or the second (219–199 B.C.), and the Ptolemy Euergetes with Ptolemy Physkon, who reigned from 170 to 116 B.C. Thus the work may have been originally written either about 300 or 180 B.C. and translated at some time during the 2nd century B.C. In substance it is chiefly a collection of moral maxims, modelled on, and sometimes borrowed from, Solomon's Proverbs. In part they are grouped by subjects, but the work was perhaps composed piecemeal and exhibits no very definite scheme. It opens with a noble exordium on the supreme wisdom of God and an exhortation to patience and trust, and contains descriptions of nature, and passages of very great beauty and eloquence in praise of famous men. (*See* chap. xlii. 89.) At the same time, the sayings are sometimes homely, and sometimes exhibit mere self-regarding, worldly wisdom. There is little or no trace of belief in Satan, of the hope of a Messiah or a resurrection, or of the doctrine of a future life. The work is of much importance as exhibiting Judaism in a stage hardly known otherwise: slightly touched by Greek thought, but little affected by Alexandrian influences, *e.g.* wisdom is not personified here as in the book bearing that name. The work is perhaps alluded to in the Epistle of St. James (i. 19; *cf.* Ecclus. v. 13). It is often quoted in the Talmud and by Clement of Alexandria, and was held in high esteem by St. Augustine as well as by the reformers of the 16th century. At least two well-known hymns—*Jesu, the very thought of Thee*, and *Now thank we all our God*—are said to be derived from it, and it had a considerable influence on liturgical language of the early Church

Ecgonine, a basic substance, of composition $C_9H_{15}NO_3 + OH_2$, which is obtained in prismatic soluble crystals by the decomposition of cocaïne.

Échelon (French, the rung of a ladder), a method of forming troops, so called either from its appearance or because the different bodies concerned can support or replace each other, and so be used successively to attain their end. The line is broken into parts, which are moved forward successively, so that each part is parallel to the rest, but no two form part of the same line, and each has its front clear of all those in advance of it.

Echemin, an Algonquian nation formerly powerful in New Brunswick and Lower Canada, where their name still survives in Lake Echemin and its emissary the Echemin river, which flows to the St. Lawrence a little above Quebec. A few half-breeds crossed with early Scottish, English, and especially French settlers, are still found in the St. John river basin, where they live mostly by fishing and hunting, though some cultivate a little ground round about their log-huts. They are distinguished by their squat figures, thick lips, prominent cheek-bones, small eyes, and lank, black hair, altogether resembling the Eskimo more closely than the ordinary Algonquin type. [ALGONQUIN.] These half-blood Echemins (properly Eteminquois) suffer much from pulmonary affections; they age prematurely, and, as infant mortality is excessive, they are evidently dying out, like their Mic-Mac and Abenaki neighbours. They were evangelised two centuries ago by the French missionaries, and now pass for Roman Catholics. Their Algonquian dialect is also largely affected by French and English influences. This language has been studied by Père L. E. Demillier (*MS. Dictionary*) and by Dr. Joseph Barratt, who shows that it is the same as that of the Passamaquoddy Indians of New England. (*Key to the Indian Language*, etc., Middleton, Connecticut, 1850, and other writings.)

Echidna, a genus of primitive mammals, constituting with *Ornithorhynchus* (q.v.) the sub-class *Prototheria* (= *Monotremata* = *Ornithodelphia*). This genus, which has several species, is confined to the Australian region, and owes its scientific name (= viper) to the presence of a perforated spur on the heel, long supposed, but erroneously, to be poisonous, though its function, as well as that of the glands with which it communicates, is unknown. The best-known species, *E. hystrix*, from Australia, is about a foot long, and in appearance resembles a hedgehog with a long, naked snout, and strong feet fitted for digging. The ends of the toes of the hind

feet turn outwards and backwards when the animal is at rest. Ants are its favourite food, and these are taken with its long protrusile tongue, which is covered with a slimy secretion to which they adhere, and, after being swept into the mouth, they are crushed between the spines on the palate and tongue. Like the Ornithorhynchus, the Echidna lays true eggs, which are carried in a pouch till hatched. The Tasmanian form, which has the hair sufficiently long to cover most of the spines, is probably only a variety, though some authorities give it specific rank as *E. setosa*. New Guinea has two forms—*E. lawesi*, from the neighbourhood of Port Moresby, distinguished by its long cylindrical spines, and the bristles on the face, and *E. bruijnii*, from the north of the island, with three rows of recurved spines on the tongue, whence it is sometimes made a separate genus (*Acanthoglossus*). These animals are popularly known as Porcupine Ant-Eaters.

Echinanthus is the name of an important genus of Sea-urchins, and belongs to the family *Clypeastridæ*. The best-known species is the West Indian *Echinanthus rosaceus*, Linn. (or, more strictly, *Echinanthus reticulatus*, Linn.). The members of this genus differ from *Echinanthus* in the fact that the margins are swollen and the base rounded, instead of sharp and flat respectively. The name has often been applied to a genus of fossil forms belonging to a different group.

Echinidæ, a family of Sea-urchins (*Echinoidea*), of which the common Sea-urchin or Sea-hedgehog (*Echinus esculentus*) is the type.

Echinococcus is a tapeworm in its encysted, or resting stage. That of the well-known species *Tænia echinococcus* of the dog had been described as a distinct genus and specimen, as *Echinococcus veterinorum*. [TAPEWORM.]

Echinocorys is the name of the genus of Sea-urchins which includes the chalk "Shepherd's Loaf." This is one of the best known of typical chalk fossils, but is usually referred to as *Ananchytes ovatus*. As this name, however, is of a later origin than *Echinocorys scutatus*, the latter is now adopted.

Echinodermata, one of the Phyla, or main groups of the animal kingdom. It includes the Sea-cucumbers, Sea-urchins, Starfish, Brittle-stars, Sea-lilies, and some less-known extinct classes. The name is derived from the best-known member of the group, the common Sea-urchin (*Echinus esculentus*), and means "spiny-skinned." This term is not, however, appropriate to some groups, such as the Sea-cucumbers, in which there is either no skeleton or only a few thin, scattered plates, or spicules. The one character which all the Echinodermata possess in common is a series of canals, tubes, or reservoirs that convey water throughout the body. This is known as the "water-vascular system." Its function is either respiratory (Sea-lilies), locomotive (most "regular" Sea-urchins, including the common British species), or both (as in the Heart-urchin). In addition to the water-vascular system, there is a series of vessels through which flows the blood. This is, therefore, called the blood-vascular system. It serves to distribute the food after its digestion in the stomach. As the blood is not definitely corpusculated, the so-called "corpuscles" having very irregular forms, the blood has been called the "chylaqueous fluid." The nervous system is very primitive in character; it consists of a series of nerve cells scattered about the muscular tissue; processes from these cells may unite with one another to form a loose nerve-plexus, or cord. The nerves are usually in the superficial layers of the body. The digestive system differs from that of the Cœlenterata (q.v.) by being closed and completely separated from the body cavity. There is a mouth generally opening in the centre of the oral or abactinal surface. This leads by a short œsophagus to a simple but fairly capacious stomach, or "gut." The gut in the Sea-lilies and extinct blastoids and cystoids was a wide coiled tube. The intestine is short, and may open to the exterior by an anus; in many members of the group, however, there is no anus. From the stomach five pairs of pouches arise, and serve to store and digest food; these are known as hepatic cæca. The nervous, blood, and water-vascular systems of the Echinodermata are all arranged fundamentally on the same plan. Each has a ring round the œsophagus, from which five branches radiate. The animal is, therefore, composed of five similar portions, or "actinomeres." These may be more or less completely marked of arms, as in the Starfish, Brittle-stars, and Sea-lilies, or of five segments, as in the Sea-urchins and Sea-cucumbers. The development of the Echinodermata is marked by a remarkable metamorphosis, the details of which differ greatly in the different classes. Reference should be made to each of these. The Echinodermata are all marine, except a few forms which live in brackish water. They have a great range in space, depth, and time. Owing to the strength and importance of their skeletal structures, they are often preserved in a fossil condition, and are of great value to the geologist. The Echinodermata may be grouped into classes :—

I.	Cystoidea.	All extinct.
II.	Blaistoidea.	All extinct.
III.	Crinoidea,	or Sea-lilies.
IV.	Ophiuroidea,	or Brittle-stars.
V.	Asteroidea,	or Starfish.
VI.	Echinoidea,	or Sea-urchins.
VII.	Holothuroidea,	or Sea-cucumbers.

Echinoidea, a class of Echinodermata (q.v.), including the Sea-urchins. The characters of the class are that the skeleton consists of 20 zones of plates (the number varies in some extinct genera), generally solidly united to form a spherical-, heart-, or disc-shaped body. Each plate bears one or more spines. Ten of the zones are usually smaller than the others, and are perforated for the passage of the "tube feet," and for the ambulacral areas. The mouth opens on the ventral or actinal side of the body, and is typically central in position. The anus opens either at the dorsal or abactinal pole of the body or in some position in one of the inter-ambulacral areas which is thereby marked out as the posterior. Echinoids are always free, and never have a stalk or any indication of one. The main character of the Sea-urchins is the skeleton, or test. This is

composed of five sets of plates, arranged in vertical series. In all living forms there are ten pairs of vertical series, five being ambulacral and five being of larger plates separating these. In many extinct genera the number, however, is irregular. They usually occur in ten alternating series of plates, but each series may consist of more than one pair, as in *Melonites;* the interradial series may be more than a pair in number, as in *Archæocidaris*, or they may each consist of only a single series, as in *Bothriocidaris*. The plates of the interradial series remain distinct, but those of the ambulacra may be united into compound plates, the nature of which differs in the different groups. In addition to the vertical series of plates there is usually a group of plates arranged as one ring of ten plates, or as two rings of five plates, at the upper pole of the body. In the regular Echinoids the anus opens in the middle of this group, but in the higher forms the anus has worked back till it opens in the posterior interradius, far from this "apical system" (q.v.), or even on the under-surface. In some of the most specialised Echinoids the apical system has been broken up (as in *Collyrites*), and in others it cannot be traced (*Pourtalesia*). The most important of the remaining skeletal structures are the jaws, and the "perignathic girdle" of processes around the mouth, which support these. The jaws are not found in the order *Spatangoidea*. The structure of the jaws and details of the anatomy of a typical Echinoid are given under SEA-URCHIN (q.v.). The plates of the skeleton are usually ornamented by a series of small prominences or tubercles, which bear the spines. These serve for protection and locomotion, the animal often walking on the tips, as on stilts. The largest spines are called "primaries;" but there are series of much smaller ones, borne on small tubercles or granules, known as secondary tubercles or miliaries respectively. In many of the Spatangoids, or Heart-urchins, there are narrow bands of crowded minute granules, forming the fascioles. These bear small spinelets, and some of the modified spines known as pedicellariæ. These structures consist of a short flexible stem, bearing a head formed of two or three jaw-like valves. The use of these pedicellariæ is not quite decided, but they appear to act to some extent as organs of defence; while they have also been seen to pass the excreta from the central anus to the margin of the body. The Echinoidea are at present grouped into two main groups—the Palæechinoidea and the Euechinoidea; the former, however, is a motley collection of extinct forms that must be eventually dispersed. It includes most of the Palæozoic representatives of the class. The most remarkable form included in it is the abnormal *Tiarechinus* that lived in the lagoons among the Triassic coral reefs of the Tyrol. The Euechinoidea are divided into five orders—Cidaroida, Diadematoida, Holectypoida, Clypeastroida, and Spatangoida. The oldest known Echinoidea comes from the Ordovician rocks; the fossil forms are most abundant in the seas of the Jurassic, Cretaceous, and Cainozoic. They are of much value to the geologist, as they give so much assistance in problems of geographical distribution, as their range in depth is generally marked by definite characters. All the living Echinoids are marine; they occur in most seas and at all depths, but abound most in the shallower parts of the tropical and subtropical regions.

Echinolampidæ, a family of Sea-urchins of which the type-genus *Echinolampas* is very abundant in the Lower Cainozoic beds. The genus still survives in the West Indies, Pacific, etc.

Echinopædium, a name applied to the larvæ of some of the Echinodermata, including the Pluteus (q.v.) and Bipinnaria (q.v.).

Echinophærites, an interesting genus of Cystoidea that lived in the Lower Silurian period, and had a compact globular form.

Echinothuridæ, a family of Sea-urchins of which the type-genus is the chalk fossil *Echinothuria*. The best-known genera, however, are the living *Asthenosoma* and *Phormosoma*, which are mostly deep-sea dwellers. The most striking character of the family is that the tests are flexible and the plates imbricate; the spines are small and covered in membrane, and the apical system (q.v.) is rudimentary. These are all primitive characters, but the family is in all probability degenerate rather than ancestral. An "echinothuroid" form is probably attained by representatives of the different orders. The genus *Pelanechinus* from the Corallian rocks is usually referred to this family.

Echinozoa, a name given to a subdivision of the phyllum Echinodermata, and including the Echinoidea, Asteroidea, and Ophiuroidea (brittle-stars), and sometimes the Holothuroidea. The last is, however, often separated as a distinct group under the name Scytodermata.

Echinus. [SEA-URCHIN.]

Echo, in *Acoustics*, is a reflection of sound. Sound is a wave-motion through some sort of medium capable of transmitting it; when the wave reaches a surface that either partially or wholly resists farther motion onwards, it is partially or wholly reflected back through the original medium. The wave of sound may affect the ear of an observer both before and after reflection, and so produce the effect of two distinct sounds. If the source of sound be close to him, the interval that elapses before the echo reaches him will represent the time taken for the wave to travel to the reflecting surface and back again. Taking the speed of sound as 1,100 feet per second, a cliff 55 feet away from the source of the wave-motion would reflect it back to the same place in $\frac{1}{10}$th of a second, because in that time 110 feet could be traversed by the wave. Such an interval as this is just distinguishable by an ordinary ear; but for the echo to be more distinctly isolated greater distances than 55 feet are necessary. For the echo to be as loud as possible the reflecting surface must be so shaped that the wave is concentrated towards the observer; but whereas this makes the echo louder in that immediate region, it renders the sound less audible elsewhere. Cliffs that are hollowed out with deep recesses illustrate this well, as also do the "whispering galleries" in various buildings. An irregular reflecting surface may send back many reflected

waves, and so produce several echoes. This is shown by the echoes of thunder among the clouds, which cause the long-continued reverberation familiar to all. Among well-known echoes may be mentioned that of the Lorelei rock on the Rhine, which is said to repeat sounds fifteen times; that of the tomb of Metella, near Rome, which will repeat a hexameter line; and that of Simonetta, near Milan, which gives sixty definite echoes of the report of a pistol.

Ecija, called from the great heat that prevails the "Frying-pan of Andalusia," is a Spanish city in the province of Seville, situated on a tributary of the Guadalquivir, 53 miles N. of the city of Seville. It was a Roman colony, and there are some Roman remains. A fine old bridge crosses the river, and there are some old gateways in the walls, and the town has six churches and some interesting buildings. There is a good square, with porticoes round and a fountain in the middle, and there is a fine promenade along the river bank. The chief productions are woollen cloth, linen, flannel, and silks, and corn, wine, and some cotton are produced in the neighbourhood.

Eck, JOHANN MAYE VON (1486–1543), a German theologian, who took his name from his birthplace, Eck, in Swabia. He was learned in the works of the fathers, and was skilful in argument, and was a formidable opponent of Luther and Melancthon. He studied at Heidelberg and other places, and was ordained in 1508, and was appointed Professor of Theology at Ingolstadt, a post which he held till his death. He challenged Luther and Carlstadt, and in 1519 held a disputation with them at Leipzig, with Luther upon the Pope's supremacy and similar points, with Carlstadt upon grace and free-will. He made three journeys to Rome, from the first of which he brought back the bull which proclaimed Luther a heretic. He took part in several conferences, among them being the Augsburg Diet in 1530 and that of Worms in 1540. His work upon Papal Supremacy was written in 1520, and his controversial works were collected into four volumes.

Eckermann, JOHANN PETER (1792–1854), a German man of letters born in Hanover, and known chiefly as the friend and editor, and to some extent biographer, of Goethe. After a year in the army and two years in the Hanoverian war office, he became a student, and shortly afterwards published a work upon Goethe, who thereupon employed him to prepare an edition of the poet's works. In 1830 he travelled with Goethe's sons, and in 1839 brought out a complete edition of the poet's works. His *Conversations with Goethe* are highly valued, and have been widely translated.

Eckhart, MEISTER, a German mystic philosopher and divine of the 13th century. He was a Dominican, and attained a high standing in the order. In the later years of his life he preached at Strasburg, Frankfort, and Cologne, dying in 1327. His theory was that ultimate Being is without personality, but contains potentially the differentiæ of existence and personality; that self-conscious personality arising from absolute personality became God the Father, the self-consciousness giving rise to the Son and to the Holy Spirit, Who is the will of Father and Son. This development, however, is not successive but simultaneous and eternal. He further held that all creation contains part of the Divinity, and that the soul of man has a spark of Divine Essence, which strives to return to its original source. His views of the expurgation of the soul till it is filled with the Divinity have much that is akin to the Buddhist doctrines. In 1325 Eckhart was accused of heresy, and cited before the Archbishop of Cologne, but the charge was not made good, though after his death a papal bull declared his writings heretical. Sermons and tracts of his in Latin and German are extant.

Eclampsia, a term applied to the epileptiform seizures which occur in association with certain morbid conditions. The most common use of the word is in the expression *puerperal eclampsia*, which is applied to the epileptiform attacks which in rare instances occur during parturition. Infantile convulsions are sometimes spoken of as *infantile eclampsia*, and the terms *scarlatinal* and *uræmic eclampsia* are also employed. [CONVULSIONS.]

Eclecticism (Gk. *eklegein*, to choose out), a term applied to those systems of philosophy which are composed of doctrines borrowed directly from other systems and more or less harmonised. Such systems are not uncommon when conflicting philosophical schools with developed doctrines exist and philosophical interest and study are general, as in the present day. Usually eclecticism exists side by side with scepticism. While the sceptic rejects all systems on the ground that none is satisfactory and that they are mutually destructive, the eclectic sees truth in all and tries to select and combine it. When Greek philosophy came into Rome as part of Greek culture, it was natural that such Romans as studied it more profoundly should not take decidedly to any one school. And as the scepticism of Carneades (q.v.), with its destructive criticism, had emphasised the need of practical standards of belief and conduct, it was natural that an attempt should be made to supply them from previous thought. We find, moreover, a certain tendency to similarity and compromise in the Stoic and Epicurean as well as the Sceptic schools in the first century B.C. All this prepared the way for the Eclecticism of which Cicero may be taken as the type. While considering himself one of the New Academy, and therefore bound to maintain that final acceptance of any philosophical doctrine is impossible, he nevertheless accepts definitely the Stoic doctrines of the existence and providence of God and the equality of men as rational beings bound by a law of nature and reason; yet he is not, like the Stoics, materialist, nor does he accept all their moral doctrines. Another "eclectic," Sotion of Alexandria, the teacher of Seneca, combined Stoic and Pythagorean views. It need hardly be said that this fusion and reconciliation of views prepared the way for that far more extensive fusion which culminates in Neo-Platonism.

Eclipses, in *Astronomy*, are special phenomena which occur when the sun, earth, and moon are in a line. When the earth is between the moon and the sun, the moon lies in the shadow of the earth, and so suffers temporary obscuration; a *lunar eclipse* then takes place. When the moon passes between the earth and the sun, the latter is at certain places on the earth obscured by the dark body of the moon, and a *solar eclipse* takes place. The comparative rarity of these occurrences, and the grandeur of the effects produced, have combined to impress the ancients and uneducated people of later ages with a deep sense of their supernatural origin.

(*a*) *Lunar Eclipses.* The shadow cast by the earth is conical, and may be shown to extend about 1,000,000 miles from its surface. At a distance of a quarter of a million miles away the width of this shadow is about 6,000 miles; and if the moon passes into it at that approximate distance from the earth, its disc of 2,000 miles diameter may be partially or totally obscured. The moon and sun may be on opposite sides of the earth, and yet the former not in shadow. This is due to the fact that the moon's orbit round the earth is not exactly in the same plane as that of the earth's orbit round the sun. If it were so, we should have total eclipses at every full moon; but since the two planes are inclined to each other at an angle of 5° 9′, eclipses will occur when the moon is at or near its *nodes* or positions of coincidence with the plane of the ecliptic. Partial eclipses are produced when only a portion of the moon passes into shadow; annular eclipses such as are sometimes observed in the case of the sun cannot occur with the moon.

(*b*) *Solar Eclipses.* The shadow cast by the moon is also conical, and extends over a slightly varying distance of about a quarter of a million miles from the moon's surface. This being the approximate distance of the moon from the earth, it is seen that when the moon is between the earth and the sun the shadow may reach the earth. The extreme limit of the shadow may range from 23,000 miles short of the earth, in which case an entire eclipse of the sun is impossible, to 15,000 miles beyond the earth. In the latter case a circular shadow will be projected on the surface of the globe, travelling onwards slowly in the direction of the motion of the moon. Within this shadow or *umbra* the body of the sun cannot be observed, and a total eclipse prevails. A circular region exists round this shadow, in which only part of the sun is visible; this region is therefore partly in shadow, and is called the *penumbra.* Outside the penumbra the whole sun may be viewed; the moon's shadow is not nearly large enough to render a solar eclipse co-existent over all parts of the earth's face towards the sun.

When the moon's shadow falls short of the earth there still exists a shaded circular region on the globe where the black disc of the moon obscures the central portion of the sun. But the disc has not a sufficiently large angular diameter to hide the whole face, and a ring of light still remains. This is an *annular* eclipse; it takes place when the moon is at a great distance from the earth compared with the sun's distance. It is evident that solar eclipses resemble lunar ones in occurring only when the moon lies nearly in the ecliptic. The general appearances of the sun's surroundings during an eclipse are mentioned in the article SUN. Four is the usual number of eclipses of sun and moon in a year; they cannot be less than two or more than seven.

Ecliptic, in *Astronomy*, is the path in the celestial sphere apparently taken by the sun during each year. It is a great circle, cutting the celestial equator at two points 180° apart, and making with it an angle of about $23\frac{1}{2}°$. It defines the plane in which the earth is moving round the sun. The name was given to it by early astronomers, who observed that eclipses only occurred when the moon was crossing it. [ECLIPSES.]

Eclogue (Gk. *chosen out*), a short poem describing some scene or episode in pastoral life—frequently a musical contest between shepherds, or the lament of a disconsolate lover. The poems of Theocritus bear the name and are imitated by Virgil, who again has found modern followers.

Ecstasy (from a Greek word, signifying a *trance*) is a condition occasionally met with in hysterical subjects and in religious fanatics, in which the mind of the patient is a complete blank, save as regards some all-overpowering delusion. In some instances the subject of the ecstatic condition will remain for days apparently completely insensible to external impressions; in other cases the patient is noisy and excited, and the *dancing mania* of the Middle Ages represented probably a state allied to this. The treatment of ecstasy is mainly a matter of the exercise of moral influence over the patient, combined with good food and the removal of unhealthy mental surroundings. [HYSTERIA.]

Ecthyma, a term applied to certain forms of pustular eruption of the skin. The individual pustules may be as large as a split pea; after a while the contained matter escapes and scabs are formed, the healing process being sometimes very slow. The term *impetigo* is often used as synonymous with ecthyma. One variety of the affection is markedly contagious (*impetigo contagiosa*); it commonly occurs in young children. The local treatment of ecthyma is practically identical with that of eczema (q.v.); the general health is almost always at fault, and tonics and change of air are usually indicated.

Ectocyst, the name of the external layer in the wall of the Bryozoa.

Ectoderm, the external layer of the bodies of the Lower Metazoa (q.v.); it is formed from the epiblast. The more specialised covering of the Higher Metazoa is known as the epidermis.

Ectoparasite. [ENDOPARASITE.]

Ectoprocta, the group of Bryozoa (q.v.) which includes nearly all the common forms. The characters are that the anus opens outside the ring or

horseshoe-shaped series of tentacles (the lophophore), which is, moreover, placed behind the oral aperture ; a large body cavity (cœlome) is present. The group is divided into two divisions, the Phylactolæmata (q.v.), and the Gymnolæmata (q.v.).

Ectosarc, the name of the exterior zone of clear but tougher protoplasm in most Protozoa (q.v.), and typically in the *Amœba* (q.v.). It encloses the central and more active endosarc. The ectosarc is probably formed by the dehydration (removal of water) of the originally indifferentiated protoplasm. It is also known as exoplasm.

Ectropion (from two Greek words, signifying to turn out), the condition in which the margin of the eyelid is everted, exposing the conjunctival surface. It may result from the contracting cicatricial tissue of a scar produced by a wound of the face, or may be produced by chronic inflammation of the conjunctiva. The only cure for marked ectropion is by operative treatment.

Ecuador, a South American republic, situated, as the name implies, upon the equator, having the United States of Colombia on the N., Peru on the S., Brazil on the E., and the Pacific Ocean on the W. As its limits are disputed, its precise extent is unknown ; but it has 400 miles of sea-coast, and has been variously estimated to contain 127,000 and 248.000 square miles. The Andes pass through the territory with two parallel Cordilleras, between which lies a valley, 300 miles long and 40 miles wide, further divided by cross-ridges into three great river basins. This valley is at a height varying from nine to fourteen thousand feet, and of the two parallel mountain ranges the western, though of a lesser average height than the eastern, contains the highest points, Chimborazo attaining a height of nearly 21,000 feet. The conspicuous peak of Cotopaxi is not at present an active volcano, although it has broken out as late as the early part of this century, and Pichincha was active four centuries ago. In all there are twenty volcanic summits. Imbabura has at times emitted much mud and water, but there seems to be some doubt whether these have not proceeded from the melting of glaciers. Cayambi is on the equator, Antisana is 1,900 feet in height, and Sangai is a restless volcano. The line of perpetual snow is here at 15,700 feet. The rivers on the E. belong to the Amazon system, and those of the W. flow to the Pacific. Those on the E. are, for the most part, torrents which cannot be navigated, and the chief of them are the Napo, Tigre, and Patasca, which flow into the Marañon. On the W. the chief are the Mira, the Esmeraldas, and the Guayaquil, the last of which has at its mouth a harbour formed by the island of Puna, which was the landing-place of Pizarro. Ecuador has every variety of climate from the *tierras calientes* in the lowlands to the *nevados* above the snow-line. Of the three basins or plateaus mentioned above that of Quito is 9,500 feet high, that of Ambato 8,500, and that of Cuenca 7,800. Quito enjoys a perpetual spring, with an abundant gentle rain, which falls at certain constant hours and renders the plateau very fertile, but the other valleys are much less productive. There are some small lakes and hot springs. The minerals of the country are little worked, but there are gold, silver, iron, lead, tin, zinc, and copper, and some good coal, and there are quarries of marble, alabaster, gypsum, and slate. The commerce is not important, but from Guayaquil are exported cocoa, indiarubber, bark, coffee, hides, and ivory nuts, and there is some manufacture of Panama hats and other plaited articles. Some of the uplands are covered with dense forests, and the *llanos* of the lowlands are extensive. The animals of Ecuador are for the most part the same as those of the neighbouring countries, the most conspicuous of them being the condor, which inhabits the Andes. More than half of the population are aboriginal Peruvians, who form the bulk of the labouring classes. Next come the negroes, and the mixed blood of mulattoes, mestizoes, and zamboes, and last in numbers, though they are the chief landholders, are the Spanish creoles. The independent republic of Ecuador dates from 1822, and is administered by a president, elected every four years, with a vice-president and two ministers, a Council, and a Congress consisting of a Senate of 18 and a House of Deputies of 30, both elected by universal suffrage. The four largest towns are Quito, Guayaquil, Cuenca, and Loja.

Eczema, a vesicular eruption affecting the skin. It usually commences with itching, and an examination of the affected part reveals the presence of a number of minute prominences, or papules as they are called. Within each papule a small collection of fluid appears, and the papule becomes a vesicle ; the vesicle then bursts, and the contained fluid exudes, and, drying on the skin surface, forms a scab. Matters are complicated, as a rule, by the scratching and rubbing of the inflamed surface, which are provoked by the intense irritation of the affected parts. Eczema may be acute or chronic. In the former case the disease runs its course in a few weeks, and may then completely disappear. Often, however, the subsidence of the acute mischief is followed after a brief interval by a fresh outbreak of the disease, which becomes chronic, and may persist even for months or years. The head and scalp (*eczema capitis*) are often the seats of eczema, particularly in children ; the skin behind the ears is frequently involved (*eczema aurium*) ; or the cheeks may be attacked (*eczema faciei*). Other favourite situations for the disease are the flexures of the joints, the nipples, and the hands and wrists (the latter being not uncommonly affected in persons engaged in certain occupations —baker's and grocer's itch). The causes of eczema are obscure ; it is said to be hereditary, and is apt to occur in those who have, or whose families have, a tendency to gout and asthma. It is also known to be dependent upon certain forms of local irritation. The disease is not contagious. The treatment of eczema may be divided into general and local treatment. Under the former head, careful dieting demands consideration. Milk, fresh fruit, and vegetables should be freely partaken of, meat must only be eaten in moderation, and alcohol

should be avoided. Pastry and rich foods of all kinds are considered harmful. The bowels must be regulated, and alkalies are often prescribed. In chronic cases small doses of the *liquor arsenicalis* are employed with benefit. As a local application in acute cases lead lotion or zinc ointment may be used; in chronic eczema preparations containing creasote or tar ointment are often applied. The affected areas must be kept clean, but soap is to be avoided; bran and oatmeal are sometimes used for cleansing purposes.

Edar, a Rajpoot state of Gujerat, tributary to the Gaikwar of Baroda, the political supremacy being vested in the presidency of Bombay. The state contains 4,966 square miles, and has a capital of the same name.

Eddystone, a cluster of rocks, some of which are partially uncovered at low water, lying about 14 miles S.W. from Plymouth breakwater, and surmounted by a lighthouse. The erection of a lighthouse on the rocks was first proposed to the Trinity House in 1691 by Mr. Walter Whitfield, and, at this gentleman's expense, one was begun from the designs of Mr. Henry Winstanley, of Littlebury, Essex. A light was exhibited from it in October, 1698, but in the following year the structure was raised by 40 feet, so as to have a total height of 120 feet. This lighthouse, which was of wood, was totally destroyed in the great storm of November 26th, 1703, its architect, who chanced to be in it at the time, perishing with it. A second lighthouse, built of wood upon a basic core of granite, was designed and completed by Mr. John Rudyerd, silk mercer, of Ludgate Hill, aided by Messrs. Norcott and Smith, shipwrights, of Woolwich dockyard. Its height to the top of the ball was 92 feet, and its greatest diameter 24 feet; and the light, which was first shown in July, 1708, was supplied by twenty-four candles, five of which weighed 2 lbs. apiece. Rudyerd's work was accidentally destroyed by fire in 1755. The construction of a third lighthouse on the rocks was, upon the recommendation of the Royal Society, entrusted to Mr. John Smeaton, who built it of dovetailed blocks of stone. It was begun on August 5th, 1756; the last stone was laid on August 24th, 1759; and the light was first exhibited on October 16th, 1759. Candles were superseded by oil-lamps and reflectors in 1810, and these by a lenticular apparatus in 1845. Smeaton's building would have remained until the present time but for the erosion of the rock on which it was planted. As it showed signs of having thus been seriously shaken, the construction of a new tower a few yards to the eastward of the old one was entrusted to Mr. Thomas Edmond and Mr. W. T. Douglass, under the superintendence of Sir James Douglass, F.R.S. The Duke of Edinburgh laid the first stone on August 19th, 1879, and the last on June 1st, 1881. The structure is of granite, 44 feet in diameter at the base, 170 feet high to the top of the lantern roof, and showing the light at a height of 133 feet above high-water mark at spring tides. The light is visible at a distance of 17 miles; and it is supplemented with a bell weighing 2 tons for use in thick and foggy weather.

Edelweiss (*Leontopodium alpinum*), a species of the *Compositæ*, related to our cud-weeds, densely covered with close, white, cottony hairs, and with radiating leafy bracts belong the inconspicuous flower-heads. Growing often in inaccessible spots at a high altitude in the mountains of central Europe, it has become a trophy of the prowess of Alpine climbers.

Eden, Emily (1797–1869), an English novelist and traveller, born at Westminster, the daughter of the first Baron Auckland. From 1835 to 1842 she was in India with her brother, who was Governor-General, and her sister, and on her return to England she published *Portraits of the People and Princes of India.* In 1866 she published *Up the Country.* Her novels are *The Semi-detached House* and *The Semi-attached Couple*, and she translated Marion de l'Orme into English blank verse.

Edenhall, in Cumberland, 4 miles N.E. of Penrith, is the ancient seat of the Musgraves, and is chiefly noted as possessing a glass goblet said to have come from the fairies, and called the Luck of Edenhall, since the well-being of the family is supposed to depend upon its safe-keeping. Uhland has commemorated it in his ballad *Das Gluck von Edenhall.*

Edentata, an order of mammals confined to the Neotropical region, and having little in common except the absence of teeth, or the possession of very imperfect ones. There are five families, of which the Aardvark, the Anteater, the Armadillo, the Manis, and the Sloth (all which see) are the respective types. The extinct Megatherium, the type of the family Megatheriidæ, belonged to the Edentata.

Edessa, the old capital of Macedonia, upon a stream 46 miles W. of Thessalonica, and at the head of a pass which commands the approach from the coast. It was the residence of the kings and their burial-place, among those buried here being Philip II. (336 B.C.), and the granddaughter—with her husband—of Alexander the Great. The old name, Ægæ, and the modern one of Vodhena are both thought to be derived from the abundant water in the neighbourhood. There is another Edessa in Mesopotamia, which came into the possession of Baldwin in the first Crusade.

Edfu, a village of Upper Egypt, on the left bank of the Nile, about 50 miles below the cataracts of Syene, in lat. 24° 58′ N. It is noted for its famous temples, one founded about 200 B.C. of great extent and imposing architecture, and adorned with elaborate hieroglyphical inscriptions, and the other containing the history of the god Horus. The villagers still manufacture a kind of earthenware which closely resembles the ancient pottery.

Edgar (944–975), a king of the English, commonly known as Edgar the Peaceable, as his reign was a period of prosperous development and greatly favourable to the fusion of conflicting national

elements. He strengthened and consolidated the internal administration of the kingdom, and formed fleets for defending the coasts against Norse rovers. St. Dunstan had a great share in the government of the land. Edgar's determined adminstration of the laws has caused him to be charged with cruelty, and his youth seems to have been particularly open to the charge of vice.

Edgar the Atheling, a Saxon prince of the 11th century, who was a kind of Young Pretender of his day. He was the son of the exiled son of Edmund Ironside, and was born in Hungary. Edward the Confessor is supposed to have had some intention of making him his heir, but the intention was not carried out. Some partisans set him up in opposition against William, but he was soon subdued, and was, on the whole, kindly treated by the three successive Norman kings under whom he lived, though he joined in more than one revolt and fought against Henry I. at Tenchebrai. Much of his life was spent in Scotland, whose king, Malcolm, married Edgar's sister Margaret, and provided the brother with a refuge as often as he made England or Normandy too hot to hold him. Edgar had some warlike qualities, and took part in a crusade, and he defeated the usurping king Donald Bane of Scotland, and put his nephew and namesake Edgar on the throne. Little or nothing is known of his later life.

Edgehill, a height upon the borders of Warwickshire and Oxfordshire, 14 miles S.E. of Warwick. Here took place the first battle of the Civil War, on October 23, 1642. Prince Rupert neutralised the advantage which a brilliant cavalry charge had gained for the Royalists by pursuing the broken wing and leaving the rest of his army to be worsted by the unbroken wing of the Parliamentarians. Charles I. commanded on the Royalist side, and Lord Essex upon the other. In 1760 a tower was built to commemorate the battle.

Edgeworth, Henry Essex (1745–1807), commonly known as the Abbé Edgeworth, was the son of a Protestant clergyman at Edgeworthstown, Ireland. The father became Catholic, and migrated with his family to Toulouse. Here the son studied, and finally entered the priesthood. In 1792 he became confessor of the Princess Elizabeth, and in 1793 to Louis XVI., in this capacity attending the king to the foot of the scaffold. After the king's death the Abbé escaped to England, and was afterwards chaplain of Louis XVIII. at Mittau, at which place he died of fever.

Edgeworth, Maria (1767–1849), novelist and daughter of Richard Lovell Edgeworth (q.v.). She was born at Hare Hatch near Reading, but when in 1782 her father inherited the family estate of Edgeworthstown, co. Longford, Ireland, Maria accompanied him to that country. Her first work was *Castle Rackrent* (1802), a novel illustrating Irish life of the past generation. In 1803 she wrote a *Treatise on Irish Bulls*, and began that series of tales by which she is best known—*Popular Tales*, *Moral Tales*, and *Tales of Fashionable Life*. *The Parent's Assistant*, *Early Lessons*, *Harry and Lucy*, and others of the same class are tales for children. She also wrote regular novels, *Belinda*, *Harrington*, *Leonora*, *Patronage*, *Ormond*, *The Absentee*, etc. Her father had, up to his death in 1817, a nominal share in the production of her works, but the real part he took in them was probably very little. Sir Walter Scott's *Waverley* is said to have been inspired by the idea of doing for Scotland what she had done for Ireland, and he sent her a copy of *Waverley*, without, however, avowing the authorship. In 1823 she paid him a visit, and later he visited her at Edgeworthstown. Since the first collected edition of her works in 1825, many editions have been published. Her great points as a writer are skilful plots, well-sustained interest, and a clear, nervous style.

Edgeworth, Richard Lovell (1744–1817), an English author, was born at Bath. In 1752 he went to school at Warwick, and, while not neglecting intellectual work, showed much devotion to sports. In 1761 he became a student at Trinity College, Dublin, going later to Oxford, and married while still an undergraduate. He then settled at Hare Hatch, and kept terms at the Temple. He was very fond of mechanical experiments, and invented a system of telegraphy and a kind of velocipede. Having made the acquaintance of Thomas Day, he became enamoured of Rousseau's educational ideas, and later took his son to Paris to show to Rousseau as a specimen of the system of *Émile*. In 1769 he succeeded to the family estates in Ireland, but it was not till 1782 that he settled down there. He was a member of the last Irish Parliament, and voted against the Union. He made many schemes for the improvement and development of his country. Besides taking a part in his daughter's literary work, he wrote several works of his own, chiefly bearing upon the objects which he had at heart.

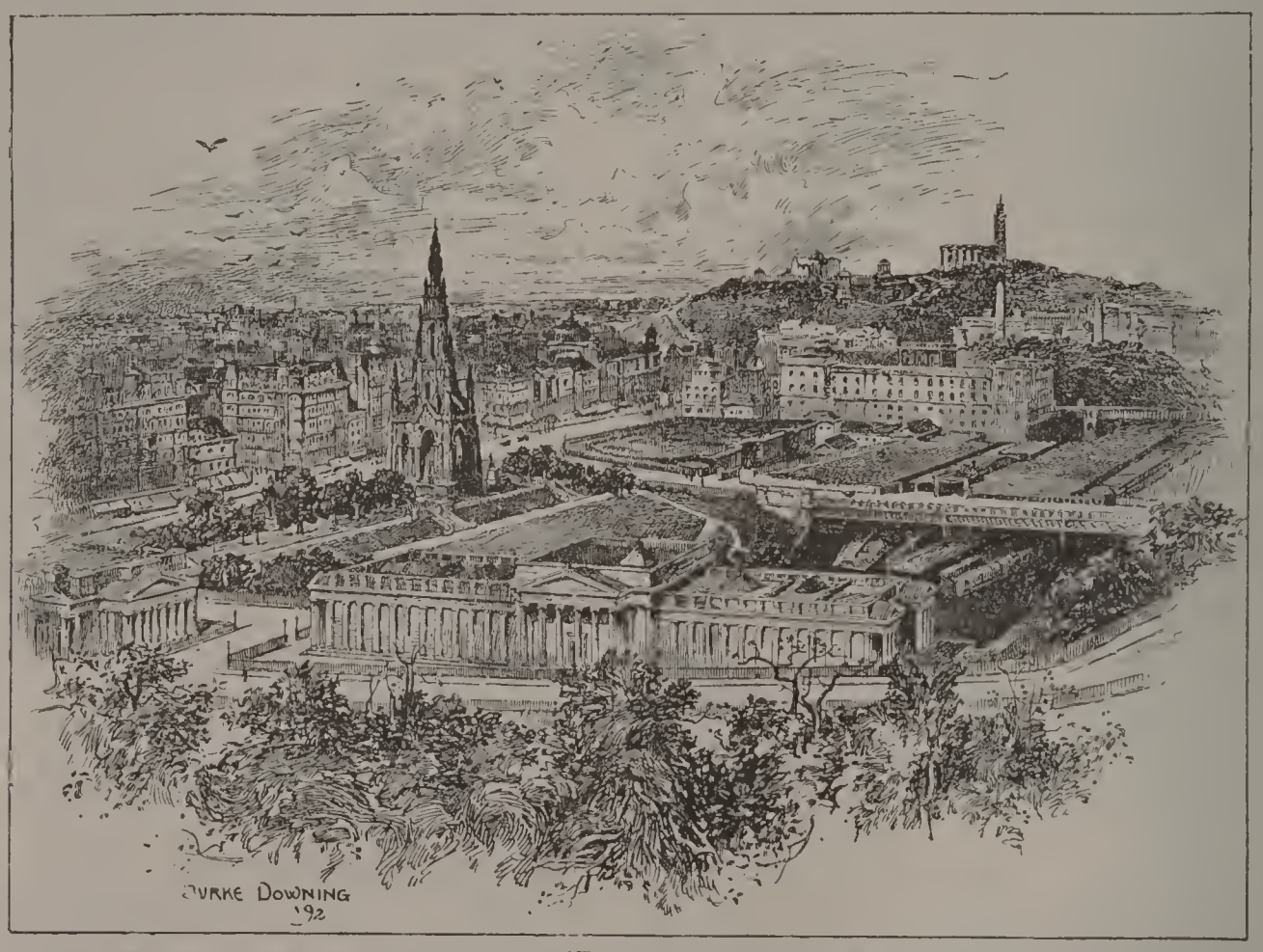
Edible Birds'-Nests, the name given to the nests of several species of Collocalia, or Swiftlets, a genus of Cypselidæ, with ten species, ranging from Madagascar over the Oriental region, and eastward through New Guinea to the Marquesas. The scientific name of the genus (from Gk. *kolla* = glue, and *kalia* = a bird's nest) embodies the fact that these nests are of a gelatinous nature. These birds build in caves, and the nests when made into soups are highly prized by the Chinese and the peoples of the Eastern Archipelago. Jerdon (*Birds of India*) says that the nest when pure and of the first make is composed entirely of a thickened mucus secreted by the birds from their salivary glands, which are very large. It is bluntly triangular in form, small in size, and slightly concave within; of a semi-transparent, fibrous sort of texture. When these nests are taken away by the men who make a trade of collecting them, the birds make others, which are mixed with feathers and other foreign substances. Some authorities say that when the salivary glands are exhausted by repeated nest-building, the secretion becomes thin and tinged with blood, which leaves stains in the nests. Mr. Layard who visited a cave in Ceylon frequented by *C. nidifica*, the Indian Swiftlet, does not confirm this. He agrees with Dr. Jerdon

in describing the first nest as the only one which is quite white and clear, and says that it is sold for its weight in silver. The Chinese are the chief customers for these delicacies, the city of Canton alone importing some 25,000,000 annually, at a cost of about £870,000.

Edict, a law promulgated by magistrates or other competent authority; a proclamation, command, or prohibition.

Edinburgh, or MIDLOTHIAN, a coast county in the S.E. of Scotland, lying for a length of about 12 miles along the S. of the Firth of Forth, 35 miles in length, and with a breadth varying from 13 to 16 miles; containing 261,602 acres, much of which is pasture-land. In the southern part of the county are the Moorfoot and the Pentland Hills, the latter of which, starting from the neighbourhood of Peebles, run from S.W. to N.E. to the centre of the county, coming within 4 miles of Edinburgh. There are fine views from the tops of the hills. There are no great rivers, but the North and South Esk are noted for the beauty of the scenery in the neighbourhood. The only river of note is the Water of Leith. The county is upon the coal formation, and coal, limestone, and sandstone are much worked. The climate in the hills is cold and healthy, and on the coast dry, cold east winds prevail. The soil is, for the most part, a clayey loam, with some sand and gravel. The farming is good, and there is much pasture, with its accompaniment of dairy-farms, as friends of Jeanie Deans will remember. There is communication by the Forth and Clyde Canal with the Union Canal, and several railways centre here. Edinburgh ale is celebrated, and the chief seat of Scottish paper manufacture is along the North Esk. The county returns one member to Parliament. The principal towns are Edinburgh, Leith, Dalkeith, Musselburgh, and Portobello.

2. EDINBURGH, the capital of Scotland, is in the county of Edinburgh, about 2 miles from the Firth of Forth, 333 from London, 42 from Glasgow, and 105 from Aberdeen. As a parliamentary borough it has four single-member divisions, and its municipal head is the Lord Provost. The town is situated upon three ridges or heights, running in an E. and W. direction, and is about 3 miles long, and the same



EDINBURGH, FROM THE CASTLE HILL. (*From a photograph by A. A. Inglis, Edinburgh.*)

in width. Lofty hills surround it on all sides save the N., where it slopes gently to the Firth of Forth. The Old Town is on the central ridge, and extends from the Castle on the W. to Holyrood House on the E., which has the Calton Hill, Salisbury Crags, and Arthur's Seat, for a background. To the N., and separated by a valley once occupied by a loch, is the New Town. The sides of the hollow are gardens, and the valley is crossed by bridges. The houses of the New Town have a bright appearance, being of white freestone, and the fine Princes Street, which is built on the N. side of the loch, and has only one side, affords a fine view of the Old Town. The best view is to be obtained from Calton Hill, which gives a view of the Firth of Forth, and the hills of Fife beyond. To the S. and across another hollow, over which there are two bridges, is another comparatively new part of the town. The Old Town has a mile-long street, which rises from Holyrood House to the Castle Hill by a steep incline. The different parts of this street have been made familiar to us by Scott—the

Canongate, Netherbow, Lawnmarket, Castle Hill, etc. The houses of the Old Town are, for the most part, ancient and lofty. Among the places of interest are the Parliament House, now part of the Court of Session, the ancient Cross (restored by Mr. Gladstone), the Tron Church, and the Netherbow Port, near which is the house of John Knox. The old closes and wynds branch off laterally on each side of the main street. Of the New Town the chief streets are Princes Street, George Street, and Queen Street, all parallel. As already said, Princes Street gives a splendid view of Calton Hill, Salisbury Crags, and Arthur's Seat. A pathway winds along and up the face of the crags. The Castle contains the ancient regalia of Scotland, and here is Mons Meg, a piece of ordnance said to have been cast in 1486. Holyrood House dates partly from James V., but most of the building is of the time of Charles II. Queen Mary's rooms remain much as she left them. There are still remains of a chapel of Holyrood Abbey, and till lately its sanctuary for insolvent debtors extended for a considerable distance around. The church of St. Giles is ancient, and has an imposing appearance. By the Parliament House is the Advocate's Library, which has the privilege of being entitled to a copy of every book published in Great Britain. There are also a National Gallery, a National Portrait Gallery, a Royal Institution, the University buildings, the Tron Church, the Royal Observatory, upon Calton Hill, and a large infirmary. The imposing monument erected to Scott is in Princes Street, and there is a monument to Burns, besides many other statues and memorials. Among charitable institutions are Heriot's and other hospitals. Among schools, the Edinburgh Academy, the High School, and Fettes College are noted. The University, which was founded by James VI. in 1582, has all the privileges of the elder universities. The corporation consists of a chancellor (elected for life), rector (elected for three years), professors, graduates, and matriculated students. Beside the ordinary four faculties, there are also degrees in science. The University possesses good buildings and appliances for study, including dissecting-rooms, botanic garden, museum, and an extensive library. The University unites with that of St. Andrew to return one member to Parliament. Edinburgh did not become the royal residence and capital till 1437, although a parliament had been held there as early as 1215. In 1296 Edward I. took the Castle, in 1650 it yielded to Cromwell, and in 1689 to William III. In 1745 Prince Charles Edward was received. Leith is the port, and almost a suburb of Edinburgh.

Edinburgh Review, THE, was started in 1802 by a coterie of literary men in Edinburgh, of whom Jeffrey (afterwards Lord Jeffrey), Sydney Smith, and Brougham were the chief. Jeffrey was the first regular editor. The first number appeared on October 10, 1802. Its success was immediate; in the next year its sale was 2,500 copies, in 1814 13,000. Scott and Wilson ("Christopher North") were among its early contributors, but were scared away by its growing Whiggism. Its attacks on the Lake Poets (especially Wordsworth's *Excursion*) and Byron are well known. The latter produced *English Bards and Scotch Reviewers.* Later, Macaulay was a prominent contributor. Its success caused the starting of the *Quarterly Review* in 1808, the *Westminster Review* in 1829, and a number of other quarterlies on the same model. Long the organ of Liberalism, it is now considered as "Whiggish" and reactionary by the bulk of the Liberal party. Constable of Edinburgh was the first publisher, but it has long been published in London.

Edison, THOMAS ALVA, an American inventor and electrician, born in Ohio in 1847. He became a railway newsboy in 1859, and soon obtained the exclusive right of selling papers on his line. His next step was to print a paper on the train while travelling. Shortly after he was able to learn the telegraph, and from that time devoted himself to electricity. He has invented an automatic repeater, a system of duplex telegraphy, the printing telegraph. In the field of telegraphy he has taken out very many patents, and has made many inventions in the megaphone, the phonograph, a telephone, and in the management of the electric light. His factory is at Menlo Park, New Jersey.

Edmonton. 1. A town of Middlesex 10 miles N.E. of the City, and forming a suburb. It is mentioned by Cowper in his history of John Gilpin's ride, and Charles Lamb lived for some time and was buried here. There is a considerable trade in timber carried on by means of the river Lea. 2. A town in the North-West territory of Canada upon the Saskatchewan river. Lignite coal here comes to the surface.

Edmund, the name of several Saxon kings, of whom one of the most famous was Edmund Ironside, born 989, the son of Ethelred II. In 1016 he succeeded his father, and for some time contended successfully with Canute. As a consequence of a defeat which he received at Assendun in Essex he came to a compromise with Canute, who received the northern and midland counties, while Edmund retained the southern. Edmund is said to have been assassinated at Oxford by an agent of Edric of Mercia, whose desertion had led to the defeat at Assendun. Canute thus became king of England.

Edmund, ST., was king of the East Angles in the middle of the 10th century. After many years of peaceful prosperity he was in 870 involved in a war with the Danes, who defeated him and made him prisoner. Upon his refusal to accept their terms of peace they beheaded him. Around his burial place a monastery and town grew up which still retains the name of Bury St. Edmunds.

Edmund, ST., surnamed Rich (1170–1240), a noted Archbishop of Canterbury. His mother Mabel was very ascetic, and from her he imbibed a strong taste for an ascetic and mystic life. He was born at Abingdon. Many stories are told of his enthusiastically religious character; for instance, that he solemnly betrothed himself to our Lady by putting

a ring upon the finger of her statue, and that his asceticism was so great that he seldom went to bed. After studying in Paris he lectured in Oxford in Logic and Philosophy, and then turning to theology he paid a second visit to Paris. He gained as great a reputation as preacher as he already possessed as lecturer. It was against his desire that in 1234 he became Archbishop of Canterbury, and in the quarrels that took place between the king and the nobles he acted as mediator, not hesitating, however, to keep the king up to the mark in fulfilling the promises he had made in confirmation of the Charter. St. Edmund boldly withstood the Papal claims where he considered them to override national rights; but the Pope was too strong for him, and he finally took refuge at Pontigny and at Poissy, where he died. His winning manners and pure, upright life caused him to be admired by his contemporaries.

Edom, a hilly country to the south of Palestine, extending for 100 miles from the Red Sea to the Gulf of Akabar. The mountains are bare, and consist of chalk and porphyry, but in parts the country is tilled and produces wine. In Biblical history it was inhabited by the descendants of Esau, and the enmity of the sons of Esau to those of Jacob was constantly breaking out with varying result. Later, as Idumea, the country gave birth to the Herod dynasty. Maan, the ancient Maon, is a halting-place for the Mecca pilgrims. Mount Hor is 4,320 feet high.

Edriophthalmata, a name once used for a subdivision of the Malacostraca (q.v.), to include all the Crustaceans in that group having sessile (or non-stalked) eyes. The Isopods and Amphipods were the principal orders belonging to it.

Edrisi (1100–1180), a great Moorish geographer, who traced his descent from Mahomet. He is thought to have studied at Cordova, and travelled in Spain, Barbary, and Asia Minor, and visited the court of Roger II., king of Sicily, who employed him in geography and on a description of the earth from the reports and statistics of many travellers who were sent out to make observations. This book was completed in 1154, and has been partially and often inaccurately translated. Edrisi made a map and a celestial sphere. He also wrote upon herbs, and another work upon geography, which has disappeared.

Education. Practically the systematic elementary education of the children of the poorer classes in England dates from the beginning of this century. There were from the earliest times of our history endeavours to give instruction in one form or another, and from the Norman Conquest to the dissolution of the monasteries the Church founded schools, established the universities, and aided generally the work of education. Edward VI. founded a number of grammar schools throughout England. In the 18th century the Society for Promoting Educational Knowledge had founded a large number of free schools, and the rise of Methodism was accompanied by the erection of schools in connection with chapels. But it is to Dr. Bell and Joseph Lancaster that we owe the first rudimentary forms of a school organisation and of a method of popular instruction, which have developed into the system which now exists. Dr. Bell was a Scottish clergyman with a love for natural knowledge and a gift for imparting it. He was urged by a friend "to go to India to lecture on natural philosophy and to do work in the way of tuition." He sailed in 1787 for Calcutta, but on reaching Madras he was invited by the committee of a military male orphan asylum to remain and take charge of the school. He agreed. There he learned from the schools of Malabar to teach reading and writing simultaneously by means of sand, in which the pupils formed the letters of the alphabet; and he devised the scheme of employing little boys as monitors in place of grown teachers. He returned to England in 1797, and issued a report on his Madras experiment in teaching. This report attracted much attention. Its most notable effect was that produced on a Quaker, Joseph Lancaster, son of a tradesman in Deptford. At the age of eighteen he had opened a school in his father's house. It was about this time he met with Dr. Bell's report, and in the year 1804 wrote to him from the "Free School, Borough Road," asking for advice, and to be allowed to have an interview with Dr. Bell. This request was granted, and they met in 1805.

Their history, so far as they were mutually concerned, was from this time one of fierce controversy, jealousy, and hatred. It was sadly typical of the subsequent results of rival, but well meant, endeavours to found a national system of popular education, but it is entirely apart from our purpose to consider it further than this mention of it.

The success of Joseph Lancaster was very marked. His private school in Southwark rose in two years to more than a thousand scholars. He was patronised by dukes, eminent members of Parliament, and finally by royalty. But his character was not equal to the strain of popularity. He was incapable of the business management and financial control of his affairs. He is said to have been vain and improvident. A few influential friends — Whig noblemen, rich Quakers, and Dissenters—paid his debts, established a society in his honour and under his name—The Royal Lancasterian Institution—but in the course of a few years a complete severance between Lancaster and his friends took place, and in 1814 the British and Foreign School Society was founded, on the principle that the education should be Christian, though not sectarian, and that the method should be monitorial. Of this method it was said by a contemporary admirer that by its means "one master can teach a thousand, or even greater number of children, not only as well, but a great deal better than they can possibly be taught by the old methods, and at an expense of less than five shillings a year for each" (*Edinburgh Review*, 1810). In 1818 Lancaster emigrated to America; from that time to his death in 1833 his life was one of alternating prosperity and disappointment.

In contrast to him, Dr. Bell, who left England in 1787 with £128 10s. in his purse, returned to

England exactly ten years afterwards with £25,935 16s. 5d. He was a careful, prudent man, invested his savings profitably, and obtained even more profitable preferments in the Church. He has been generally regarded as the founder of the "National Society for Promoting Education in the Principles of the Established Church," but it appears he was not even on its first committee. However, the society's existence was due to his influence, and his methods of instruction were adopted in the schools.

For the next twenty years the elementary education of the poor of England was practically under the care, and, so far as it existed at all, was due to the benevolence and religious zeal of those two societies. But it became increasingly evident that the voluntary resources were not able to meet educational necessities. This fact was insisted on with special emphasis by those statesmen and public writers who held the doctrine that it was the duty of the State to provide elementary education for the poor. Many efforts were made by men like Sydney Smith to arouse public feeling on the subject, and by members of Parliament to introduce Educational Bills into the House of Commons. All these efforts failed, but in the year 1834 the Government granted £20,000 towards the building of schools. This grant was to be equally divided between the National and British and Foreign Schools Societies. It did not pass the House of Commons without some opposition. Mr. Hume objected to it on economical grounds, and Mr. Cobbett from the belief that schoolmasters were "a new race of idlers." Subsequently the grant was divided according to the voluntary subscriptions raised by the societies, and, as the National Society was the richer of the two, the Church schools gradually absorbed the larger share. This led to a step which was the most important in the development of a scheme of national education. In the year 1839, from being a subscriber to the funds of the two societies for the building of schools, the Government increased its grant to £30,000, and administered it by means of a department of the Privy Council. This grant was continued to be appropriated to building purposes; the quality of education remained very much the same as it had been left by Dr. Bell and Joseph Lancaster. A competent witness said of it, "Nothing, or next to nothing, is learned, and the parents merely pay for having their children kept out of harm's way." The reports published by the Committee of Council, the Statistical Society, and quarterly reviews of the state of accommodation, of the attendance of children, and, above all, of the character of the teachers, led the Government in 1843 to take a still further step and vote £40,000 for the school-houses, and teachers' houses.

The year 1846 was the epoch of the celebrated minutes of the Committee of Education. From 1833 to that year the gross amount of parliamentary grant was £490,000, out of which schools had been built capable of accommodating 550,000 scholars. The proposals of the Government were to substitute for the old monitorial system the apprenticeship of elder scholars under the name of pupil teachers; to provide, under the name of Queen Scholarships, exhibitions to normal colleges, to be for those pupil teachers who at the termination of their apprenticeship should pass successfully an examination; to make, under the name of augmentation grants, a payment to the head teachers of schools for the instruction of their pupil teachers out of school hours. The system of inspection of schools, which had been hitherto chiefly optional on the part of the managers, to be extended, the grants to teachers depending upon the result. In spite of all these arrangements, the attendance of children at school was miserably low, and in 1853, Lord John Russell being President of the Council, the Government introduced a Bill which would have placed the education of the urban population in the hands of town councils. The Bill was withdrawn, but by a minute of Council a limited capitation grant was made to managers on condition that the scholars attended 176 days in the year, that the teacher should qualify himself by holding a Government certificate, and that three-fourths of the scholars were presented to H.M. Inspector for examination. In January, 1856, this grant was extended to the whole country; the total grant for education rose from £160,000 to £460,000. It was in this year that the first vice-president to the Council was appointed. In 1858 the Government established a kind of judicial commission, under the presidency of the Duke of Newcastle, to inquire and report on the whole subject of elementary education. It was in that year that a collection was made of all the minutes of Council under which the parliamentary grants had been administered, and they were codified for information as to the law. This, which was issued as a state paper, is known as Lord Norton's code, and was the first of its kind. The state of popular instruction as shown by the report of the commission was that only one in eight of the child population was in any school whatever, including all sorts of schools, private adventure schools, and others, and under all sorts of teachers. Of these children only one-fourth were efficiently educated; the infant schools were some of them good, but the great mass exceedingly bad. (Evidence of Mr. P. Cumin, secretary to the Committee of Education, before the Royal Commission of 1887.) In order to secure a better quality of instruction throughout each school the report recommended the examination of every child individually by the inspectors. To carry out this recommendation Mr. Lowe, who in 1861 was vice-president of the Council, drew up a code for the management of the schools and the distribution of the grants. This code was withdrawn, but in the next year the "First Revised Code" was issued, which, though it was bitterly opposed, led the way to the next great change towards a real system of national education. Hitherto all the payments from parliamentary grants had been made for Educational machinery, as the building of schools, endowments of normal colleges, etc., but now grants were added for educational proficiency. "If," said Mr. Lowe, "this new system be costly, it shall be efficient; and if it be inefficient, it shall be cheap." This was said in consequence

of the rapidity of the growth of the education grant. In 1853 the amount was £160,000. In 1859, when Mr. Lowe became vice-president, it had reached £836,920. Hence he determined that the cost and efficiency should bear some proportion. The organic principle on which schools had been assisted was to be retained, viz. the education was to remain denominational; it was to be confined to the children of the labouring class. The grants were to be given in aid of local subscriptions; were to be paid to managers, not to teachers; and on condition that the children passed a satisfactory examination in reading, writing, and arithmetic. Failure in one subject involved a reduction of the grant by a third, in two subjects by two thirds, and a total failure involved the total loss of the grant. Further, the code established six standards of instruction, and practically asserted the principle of payment by results.

The next stage in the formation of a national system of elementary education was the Act of 1870. Practically it may be regarded as the final stage, for though modifications have since been made in it, and probably other modifications may yet be made, they have been, and will be, in the form of development and expansion. This Act provided that wherever the voluntary supply of school accommodation was insufficient, school boards should be created, with powers to levy rates for the building, equipment, and maintenance of schools, and of exercising by means of local by-laws the power of compelling the attendance of children at school. The teachers of these schools were to be certificated, or preparing to sit for an examination for a certificate. The schools were to be open for inspection at all times, and subject to an annual examination by which the amount of grant was to be determined. The managers of the schools might, if they desired, teach religion and use religious exercises, but no catechism or distinctive religious formula could be used, and every school, whether under a board, or voluntary manager, must be subject to a conscience clause. The basis on which the supply of accommodation was to be calculated was one-sixth of the population. The education was to be no longer confined to the labouring class. The limit of school life was from five to thirteen years of age. A revision of the Act has raised the age to fourteen, and local by-laws vary the age for leaving school by labour tests. The Act did not supersede the code to which frequent reference has been made, though it necessitated frequent changes in it. Its provisions in relation to school maintenances are enforced by the "code." The code is the work of the department, but it requires the sanction of the Houses of Parliament. On the passing of the Act a new code was made in 1871; no important change was made till the year 1882, when the basis on which the grants were paid was changed, and every child who had been on the register of a school for six months was required to be presented for examination. The code of 1890 was framed upon the report of the Royal Commission on Education appointed in 1886, and made an essential change in the principles upon which previous codes had been constructed. The code of the present year (1892) is still further amended in the same direction, abolishing, as far as possible, payment by results, and rendering the organisation of the classes by the head teachers less mechanical, and more elastic.

The chief interest for the general public in the Code lies first in its curriculum, or the subjects which the scholars *must* learn, and those in addition which they *may* learn. The tendency is naturally towards expansion and the larger range of literary and scientific subjects. The tendency is also by authority tending towards practical work. Thus the highest award of the principal grant is allowed to schools in which the children can not only read well, but recite well from memory. Drawing in boys' schools is obligatory, and needlework in girls'. Manual instruction is encouraged in addition to drawing, and amongst girls a grant is given for a successful pass in cookery and laundry work.

The following paragraphs respecting the Code are taken from the *General Report for the Year 1891*, by the Rev. T. W. Sharpe, senior chief inspector. They are an explanation and a defence:—

"It is sometimes alleged that the Education Code enumerates too many subjects of instruction outside the scope of elementary education, to create an erroneous impression that most of these subjects are taught to all the scholars in public elementary schools. But what are the facts? Beyond reading, writing, arithmetic, drawing, singing, and needlework, no scholar, as a rule, learns more than two class subjects. (geography, grammar, history, and elementary science.) In addition to this, in some of the best schools the older boys and girls are entitled to study one or two of the long list of specific subjects enumerated in the Code; mechanics for boys and domestic economy for girls are the favourite subjects in London. Very few intelligent lovers of education would desire to exclude any of these subjects from the curriculum of a good elementary school, and would probably add three or four hours per week of manual instruction in carpentry or some use of tools, and in cookery and laundry work for girls.

"It is also sometimes alleged that some of the specific subjects named in the Code are outside the scope of elementary education, whereas there is no single subject that is not useful for the scholar's future life in some special locality, *e.g.* German might with advantage be taught to our seafaring boys in the eastern ports of the island, French in the southern ports, navigation in both; some knowledge of chemistry in the neighbourhood of the chemical works of the north of England, or of electricity for future telegraphists, or of physiology for all who value healthy habits of body, would be very helpful.

"Again, the use of a piano in a school has been attacked by the false assertion that it is introduced to teach boys and girls in elementary schools to play the piano; it might as well be asserted that a soldier is to be taught to play all the instruments in a regimental band because one of the chief uses of a band is to enliven his march and assist the regularity of his step. A school piano has a marvellous effect on the drill and marching of a class, even though the instrument may be a little wheezy or out of tune, or may perhaps have lost a note."

A second point of interest is the means by which the profession of the teacher can be entered by those who have gone through the routine of the pupil teacher's apprenticeship and the two years' training at a normal college. Section 51 reads thus:—"Graduates of any university in the United Kingdom, and persons over 18 years of age who have passed university and other examinations recognised by the Department, may be recognised as assistant teachers." (Copies of the Code can be procured at Eyre and Spottiswoode's, which persons desirous of becoming teachers should obtain.)

A third point of increasing interest is the amount which the total education grant has reached, and the

mode of its distribution. The latter fact will be found in the Code; the former is to be obtained from the annual report issued by the Department. The Act of 1891, by which the elementary schools were rendered practically free, entailed an immediate expenditure of £1,200,000, and this sum will, in all probability, increase from year to year. At the time of the presentation of the educational budget the scheme had been in existence only ten months. The return of its results was, therefore, imperfect; but Sir W. Hart-Dyke told the House of Commons that out of 19,000 schools in England and Wales, only 165 had declined to accept the Act. These must have been schools with high fees, since the fee-grant offered by the Department amounted to ten shillings per child in average attendance from three to fifteen years of age. Most schools, both Board and Voluntary, must have gained a profit by accepting the fee-grant. The children have improved in the punctuality and regularity of their attendance, and in consequence the elder scholars have had more time to devote to the higher subjects of instruction. The increase, in both respects, is very marked.

The estimates for the present year provide for £5,946,213; this is an increase of £1,220,856 over the previous year's estimate. This increase is due to the remission of fees as already stated, but also to extra grants to evening schools and to training colleges. The number of the schools inspected has been 19.508, or an increase of 89; the number of scholars on the register is now 4,824,000. In 1870 the number was 1,152,389. In the same year the number of certificated teachers was 12,467. At the present time there are upwards of 47,000 certificated teachers in England. Infants under the Code now in operation earn, on an average, a grant of 15s. 5d., and the average earnings of all scholars are 18s. 4d. The change that has taken place in the educational machinery and the results of its working is one of the most remarkable facts in the history of the last sixty years. The system is certainly costly, but we believe that Mr. Lowe's prediction in 1862 has been fulfilled, and that it is also efficient.

Edward, a favourite name held by several Saxon and later English princes. The principal Saxon bearers of the name are Edward the Elder, son of Alfred the Great, Edward the Martyr, slain by his step-mother Elfrida, and EDWARD THE CONFESSOR, who reigned 1041–1066, who owes his importance not so much to his own merit as to the facts that in him the Saxon line was restored after the Danish interregnum, through him the dynasty was again changed, and his reign rested in Saxon memories as an ideal period to be regretted and to be if possible restored. He was the brother of Edmund Ironside (q.v.), and was brought up in exile in Normandy, a fact which had far-reaching results. His marriage with Earl Godwin's daughter made him the slave of a powerful servant, and he often chafed under the yoke. Jealousy of the Godwins and a knowledge of the weakness of Edgar Atheling led him to coquette with the idea of making William of Normandy his heir, a step which, we are given to understand, he lived to repent. His alleged sanctity of life made him a favourite of the Church, and his codification of laws and good administration of justice endeared him to the people.

Edward I. (1239–1307). Of the six later English kings of the name the most noted were the first, third, and fourth, while the second, fifth, and sixth were each somewhat unfortunate in the circumstances of their lives; while one of the most English of all Edwards—the Black Prince—did not come to the throne. Edward I. was trained in a school of adversity, and profited by its lessons, both to avoid the weaknesses of his father and to keep the power in his own hands. After crushing the Barons at Evesham in 1265, he had the wisdom to turn their energies into a safe channel by engaging in a crusade. The romantic stories of his adventures in Palestine and of the devotion of his wife are sufficient proof that he had the qualities which take hold of men's imaginations. Still following out his idea of finding an outlet for superfluous energies, he set about the subjugation of Llewellyn and his country, giving the country a new prince in the person of his unfortunate son. He then made an expedition against France, and next turned his attention to making Scotland a subject state, capturing its king, Balliol, in 1296. Then after a skirmish with his clergy, he made a new expedition into France, and married his second wife. Scotland became again the object of his energies, and he found a worthy foe in Sir William Wallace, for whose treatment when captured Edward has been much blamed. In 1306 a new Scottish danger rose in the person of Robert Bruce, and the fiery old king set out once more upon the familiar war-path, but death overcame him at Burgh-on-Sands. His vigorous rule, his wise policy, his encouragement of commerce, and his codification of laws have long kept his memory green.

Edward II. (1284–1327). This king's greatest misfortune was to be the son of his father, and so to provoke a comparison which was not in his favour. Born in the purple, he was as weak and amiable as his father had been strong and, upon occasion, disagreeable. This weakness was the probable cause of his downfall, as well as his predilection for foreign favourites, which gave a good pretext for discontent to insular prejudice. His unfortunate expedition to Scotland which ended in the defeat at Bannockburn did not add to his popularity, and no doubt it was a real feeling on the part of the nation that made it easy for Isabella to compass his deposition, though the country had not so strong motives as she had for his death, and was to some extent shocked by its occurrence. One of Edward's best deeds was the founding of Oriel College, Oxford, of which body his steward, Adam de Brome, was the first Provost.

Edward III. (1313–1377). Like his grandfather, Edward III. passed a stormy youth amid the distraction of family quarrels and national turmoil. It is a very significant comment upon the death of Edward II. that the young king took an early

opportunity of killing his mother's paramour, and of keeping her out of mischief for the rest of her life. The first part of his reign was occupied by the question of Scotland. Here a kind of see-saw was going on between Edward Balliol and David Bruce, but Edward made a temporary balance by defeating the regent Douglas, at Halidon Hill in 1333. But Edward now entered upon the great scheme of his life—the obtaining of the French crown, a project which has had a lasting influence upon national history, first, as leaving a legacy of so-called natural antipathy between the English and French races; secondly, as being the root of many liberties which were concessions to the need of winning the hearts of the people of England; and thirdly, the wars led to the thorough fusion of the different and thitherto discordant elements of the national races. Edward and his son, the Black Prince, prosecuted the war in France—winning first the battle of Creçy, and then the battle of Poitiers, where a king of France was captured, after the interlude of the siege of Calais, where Philippa (with all her blushing honours thick upon her of having captured a king of Scotland) is said to have interfered to prevent her husband from committing an unknightly deed. Edward's later days were dark. His warrior son dead, his French conquests passing away, and the thought of leaving the crown to a grandson ill-fitted to cope with ambitious and powerful nobles, and his own great faculties failing, seemed but a poor outcome of a glorious reign.

Edward IV. (1441–1483), who belonged to the York branch of Edward III.'s descendants, had all the inches and all the canniness of the county from which he took his name. An injustice, perhaps, first roused him to enmity against his kinsman and king, but ambition seems very soon to have come into play. After the battles of Mortimer's Cross and Towton, by which he secured the kingdom, and his marriage with Lady Elizabeth Woodville, his next step to secure himself thoroughly was to get rid of Warwick, whose position as his father's old friend and the most powerful noble of England made him a thorn in the king's side. It is improbable that Edward altogether regretted the turn of affairs that drove him into exile and then enabled him to become the real master of the country by the defeat and death of Warwick at Barnet in 1471. The murder of Prince Edward, son of Henry VI., after the battle of Tewkesbury, has been regarded as a stain on the king's character. Edward's chief enemy in life seems to have been his own vigorous physical nature and his love of luxury. Edward was fortunate in having brothers who, to a great extent, forwarded his views. It is true that the one conspired against him, and was eventually put to death by him, and that the other murdered his sons, but they had given him valuable aid in his struggle for the throne. Edward IV. tried to keep up the traditional policy towards France, and attempted to intrigue there, but the astute king, Louis XI., was a match for many Edwards. Edward's encouragement of trade and commerce endeared him to London citizens, and that or other reasons is said also to have endeared him to their wives. He appears to have been a wonderfully fine, handsome man.

Edward V. (d. 1485), son of Edward IV., was king only in name. The kind attention of his uncle, the Duke of Gloucester—afterwards Richard III.—saved him from all the troubles that attend the wearing of a crown. There seems little ground for doubting the story of the murder of Edward and his brother in the Tower of London.

Edward VI. (1537–1553), son of Henry VIII. and Jane Seymour, had a short and, in some respects, unhappy life. He died before attaining his majority, and was only ten when he succeeded to the crown. He was carefully educated, and had much intelligence, and took great interest in his books, but, though he is represented as playing a great part in the Reformation and other public questions, he was undoubtedly more or less a puppet in the hands of his guardians. Thus it was that he was compelled to sign the warrant for the execution of his early guardian, the Duke of Somerset, and was induced by Dudley, Duke of Northumberland, to appoint Lady Jane Grey his heir. Even his death is attributed to foul play.

Edwardes, Herbert Benjamin, Sir (1819–1868), an English soldier and Indian Civil servant, was born in Shropshire. He went to India as a cadet in 1840, and, studying the native tongues, qualified as an interpreter. He attracted the notice of Henry Lawrence and of Sir Hugh Gough, on whose staff he was at the battles of Moodkee and Sobraon. He was with Sir Henry Lawrence in his residency at Lahore, and when during Sir Henry's absence in England things went wrong, Edwardes displayed much judgment and energy. His diplomacy was also used to good purpose during the Indian Mutiny. In 1865 ill-health drove him to England. Sir Henry Lawrence spoke of his having done more for India by his action in a time of difficulty than any man since Clive, and Sir John Lawrence called him a born ruler of men. Sir Herbert Edwardes began a *Life of Sir Henry Lawrence*, and wrote *A Year on the Punjab Frontier*.

Edwards, Bryan (1743–1800), the historian of the West Indies, born at Westbury. He went young to Jamaica, and inherited a fortune from an uncle, and engaged for many years in commerce. Returning to England, he entered Parliament in 1796. His *Civil and Commercial History of the British Colonies in the West Indies* was published in 1793, and in 1796 a work upon the dealing of the Jamaica authorities with the Maroon negroes.

Edwards, Jonathan (1703–1758), an American theologian and metaphysician, born at East Windsor in Connecticut. He was educated at Yale College, and was for a time a professor there. In 1727 he became minister at Northampton, where he officiated for twenty-three years, and then became a missionary to the Indians for six years. In 1757 he became President of Princeton College, New Jersey. His chief works are *Freedom of the Will* and *Original Sin*.

Edwin, son of Ella, king of Northumbria in the 6th century, was a child when his father died; and, the crown having been seized by an usurper, he was sent to the court of Redward of East Anglia, who put him upon the Northumbrian throne in 617. His wife was Ethelburga, daughter of Ethelbert of Kent, and through her influence and that of her chaplain, Paulinus, he became a Christian with his people, and built a church at York. He was killed in 633 in a battle with the Mercians under Penda.

Eeg (*i.e.* "Freeborn") the name taken by all Turkomans who can claim pure Tûrki descent as opposed to the *Kaul* (base-born, slave), that is, the issue of a Turkoman and Persian woman, and the *Dogmah*, that is, the issue of a Kaul and a Persian slave. "To a stranger these distinctions might remain unknown, unless he guessed from the beard or the handsome features of a man that he had not the honour to be altogether derived from a beardless and a noseless race" (Captain H. Collett, *The Khanate of Khiva*, p. 54).

Eel, a book-name for any fish of the Physostomous family Murænidæ, dating from the Chalk, and containing 26 genera with 230 species, widely distributed in temperate and tropical rivers and seas, some being deep-sea forms, and all frequenting the bottom. The body is much elongated, and naked or covered with rudimentary scales. There are no ventral fins, and when vertical fins are present they are continued above and below, or the continuity is broken only by the tip of the tail. The teeth are well developed, and all the species prey on other fish. [Conger, Electrical Fishes, Muræna.] The name, however, is principally used for the genus Anguilla, of which two species (*A. anguilla*, the Common, and *A. latirostris*, the Broad-nosed Eel, Grig, or Glut) are British. In this genus, which has about 25 species, from temperate and tropical rivers and coasts, minute scales are embedded in the skin, the teeth are small, and the unpaired fin is continuous. The mode of reproduction is unknown, and microscopic examination is necessary to distinguish the sexes of individuals taken from fresh water. They spawn in brackish water, or in the sea, for during the summer shoals of young eels are met with ascending rivers, passing over floodgates, and sometimes making their way across marshy ground or wet grass. Old fish, also, often leave the water by night in search of food, and they pass the winter in a torpid condition in mud. They feed principally by night on aquatic animals, spawn, and carrion. The Common Eel, the best-known species, is about 3 feet long, greenish-brown above, and whitish on the belly. It is valued as a food-fish, and on many rivers eel-fishing is an important industry.

Eel Pout, a local English name for the Burbot (q.v.). In Scotland it is applied to the Viviparous Blenny. [Blenny.]

Effervescence means the escape of gas in bubbles from a mass of liquid in which it has been compelled to remain by pressure. Effervescence will take place when the pressure is removed, as when the cork is removed from a bottle of soda-water. The same discharge of bubbles may occur when, by reason of some change in the liquid, it is unable to retain the gas. Thus ordinary water effervesces a little when heated, because hot water does not hold air so readily as cold. The action is more vigorous in the case of ammoniated water.

Efflorescence. Many hydrated substances on exposure to air lose some or all of the contained water with the formation, on their surface, of a powdery deposit. This phenomena is known as efflorescence, and a familiar example is met with in the case of ordinary soda crystals, $Na_2Co_3 \times 10\ OH_2$, but if exposed to air loses one half of its water of crystallisation. The formation of nitre and sodium carbonates upon the soil in certain localities is also a case of efflorescence.

Effluxion of Time, a phrase used in leases and conveyances indicating the conclusion or expiration of an agreed term of years specified in the deed or writing, which arises from the natural course of events, in contradistinction to the determination of the term by the act of the parties, or by the occurrence of some event upon which it is determinable under the deed.

Effusion means the passage of gases from one side of a porous partition to the other, where the pressure is diminished to zero. The apertures in the partition must be very minute. The speed of flow is proportional to the square root of the pressure applied to the gas.

Efik, a negro people of the Slave Coast, dominant in the Oyono (Old Calabar) river basin, where they form a separate group, with three branches—*Efiks* proper, *Qua* on the W. side of the Old Calabar estuary, and *Andoni* E. of Bonny. They speak a radically distinct negro language, which, however, has been subject to Bantu influences, so that the Efik serves as a connecting link between the true Negro tongue of W. Soudan and the Bantu family on their eastern frontier. At this point the linguistic parting-line is the Rio del Rey, which flows N. and W. of the Cameron Mountains, and reaches the coast at the head of the Bight of Benin.

Eft, Evvet, correct, though local, forms of newt (q.v.). The latter word really stands for *an ewt;* the Mid. Eng. *ewte* was contracted from an earlier *evete*, from the A.-S. *efeta* = a lizard.

Egba (Ebba), a large negro nation of Yoruba-land, who occupy the middle Ogun basin due N. of Lagos, and whose capital is the great city of Abéokuta. The Egbas are perhaps the most cultured of all the Yoruba peoples [Yoruba], and their language, spoken with considerable dialectic diversity, is current all over the Yoruba country. The form that prevails along the right bank of the Lower Niger has been adopted by the Protestant missionaries as the general literary standard for their grammars, dictionaries, and translations of the Bible. Many of the Egbas have become Christians, and in recent years the Mohammedans from Soudan have also acquired considerable influence

amongst these industrial and agricultural populations. The trading caravans organised by the Egbas of Abeokuta have already penetrated as far north as Timbuctoo and beyond the Niger westwards to Lake Chad.

Egbert became king of Wessex in 800, in succession to the usurper Brihtric, who had compelled him to take refuge at the courts of Offa, King of Mercia, and the Emperor Charlemagne successively. In 827 he subdued the other kingdoms, and reigned as king of all England till his death ten years later. The Danish invaders gave him much trouble in the latter part of his reign.

Egede, HANS (1686–1758), a Norwegian missionary born at Harstad. He is called the "Apostle of Greenland" for his efforts to establish Christianity in that country. He sailed in 1721 with a Danish commission as royal missionary, and after many difficulties settled with his wife and two sons, and gave himself up to studying the language and manners of the Greenlanders, and to trying to gain their confidence. He returned to Denmark in 1736, and was made director of the missions, his son being appointed missionary. His writings give much information touching the natural history of Greenland. PAUL (1708–1789), son of the above, worked with his father from an early age, and retired from Greenland in 1740. He published an account of Greenland, a grammar and a dictionary of the language, and translations of many theological works including the *Imitatio Christi*.

Eger, a Bohemian town on the right bank of the river Eger, 91 miles W. of Prague, and the centre of the railway system of S.W. Bohemia. It was once fortified, but the defences were destroyed in 1809, the only remains being some fragments and a tower, chapel, and part of the great hall of the citadel. There are some manufactures. Wallenstein was assassinated here in 1654. An avenue three miles long leads to Franzensbrunnen. The river rises in Bavaria 12 miles N.W. of the town, and has a course of 124 miles S.E. and then N.E. into the Elbe.

Egeria, a nymph in the early history of Rome who was said to have counselled Numa, and to have given him the laws which afterwards governed the state. She received divine honours.

Egg, or OVUM, the germ or female element in the process of sexual reproduction. Such a process and such a structure occurs in most groups of both plants and animals, and the latter in its earliest stage, before impregnation, consists of a single minute primordial cell or but slightly differentiated rounded mass of protoplasm. Perhaps its most rudimentary type is the "zygospore" (q.v.) of the common grey mould *Mucor* or of the algal *Mesocarpus*, in which two filaments approach one another and put out processes which become coalescent, the spore forming between the two filaments, with no appreciable distinction of sex. Such algæ as *Spirogyra*, where the entire protoplasm of one cell (male) passes into the other (female), mark a step in advance. The bladder-wrack (*Fucus*), in which eight spherical "oospheres" are liberated by the bursting of their mother-cell and are fertilised in the water by numerous relatively minute ciliated antherozoids (q.v.), presents a case more resembling that of most of the animal series. Higher in the plant-world the egg or oosphere is fertilised whilst still within a cavity at the base of a trichogyne or of an archegonium; and in the highest group of all, the flowering plants, the fertilised oosphere does not give rise directly by its division to the embryo (q.v.), but forms a chain of cells or suspensor, from the end of which the embryo originates.

Among animals the ovum or germ-cell commonly remains unicellular until impregnation, and then undergoes "segmentation," which gives rise to the yolk; and it may also become surrounded by albumen or "white," and by a "shell," either membranous or calcareous.

The number of eggs produced at one time is very variable—from 30 to 50 in the case of the snail, to tens of thousands in that of the whelk; 60 a minute or 80,000 a day in that of the queen termite, continuing for two years; nearly 2,000,000 in the oyster, and nearly 5,000,000 in the cod. The common snake lays about 20 eggs, the crocodile 25, and the turtle 150 to 200. Domestic poultry lay one egg daily for 120 to 150 days; but wild birds lay but a small number in each season.

In size, the eggs of insects, from which the larvæ emerge in a very immature state, are minute, as also are those of crustaceans, fish, and mammals. Most mollusks have minute eggs, but those of some species of whelk (*Buccinum*) and others are larger than those of many birds. In this latter group, the young attain an advanced stage of development before leaving the egg, and here we have the largest and most highly organised eggs, with yolk, albumen, and shell. The egg of the ostrich weighs as much as three dozen fowl's eggs; that of the moa (DINORNIS) is still larger, and that of extinct Æpyornis of Madagascar contained as much as 148 fowl's eggs.

Eggs are generally round and smooth, but those of insects vary in form, and are often spiny or tuberculate. Turtles have nearly spherical; crocodiles and snakes, oval eggs. Most birds' eggs are smaller at one end than at the other; but those of fowls are spherical, those of ducks, oval; and those of most sea-fowl, pear-shaped.

Impregnation may take place subsequently to the extrusion of the egg, when, of course, the whole development of the young goes on outside the body of the parent; or it may occur before extrusion. In the latter case hatching may take place outside, only a slight development, such as the formation of the "tread" or *cicatricula* in the hen's egg, taking place beforehand. Both these cases are termed *oviparous*. On the other hand, the eggs may be retained in the oviduct until the young are ready to leave, when the animal is termed *ovoviviparous*; or, the young leaves the egg and is nourished for a considerable time within the womb of the female by the close apposition of certain vascular appendages of its body to the walls of that cavity, when the animal is termed *viviparous*.

Eggs also differ considerably in the characters of their outer coverings. Many molluscs have their eggs enclosed many together in a leathery cup, which is either single, as in *Purpura*, or one of a compound mass of cups, as in the common whelk. Sharks and rays have their eggs enclosed in a four-cornered leathery pouch with mooring tendrils at its corners, familiar, when empty, on the beach, as "mermaids' purses." The eggs of frogs and toads are surrounded by a tough albuminous layer, which becomes gelatinous in water: those of snakes and lizards are parchment-like; and those of turtles and crocodiles have a calcareous shell like those of birds. Birds'-eggs, though often white, are coloured in many kinds, rarely uniformly, as in the dark green of that of the emu, but commonly spotted or lined with black, brown, green, or red. The mottling often serves a protective purpose, as in the eggs of plovers and those of various sea-birds, which are left exposed among pebbles, and closely resemble them.

Cod's roe is used as food and as bait; that of the sturgeon is made into *caviare*. The eggs of the crocodile and turtle are esteemed articles of food, as are those of many birds, especially the ostrich, plover, turkey, duck, and fowl. The importation of hen's eggs from France and Belgium is an important and rapidly growing industry.

Egg Bird, a popular name for several sea-birds that have common breeding-places, and whose eggs are gathered for food. The term is specially applied to *Sterna fuliginosa*, the Sooty Tern, which frequents Ascension Island in countless numbers in the breeding season.

Egg Plant, the white-fruited variety of the Aubergine (q.v.) or Brinjal (*Solanum esculentum* or *Melongena*), the fruit of which is highly esteemed as an article of food in France.

Eginhard (770–840), the biographer of Charlemagne, was born near the river Maine, and educated at the monastery of Fulda. As he was of noble family and displayed talent, he was introduced at Court, and was much trusted by the emperor, who made him a Minister, and gave him charge of public buildings. In 806 he went to Rome as Charlemagne's ambassador, and Charlemagne's son, the emperor Louis, made him tutor to his son, and retained him in his public office. Eginhard's wife was Emma or Imma, whom tradition upon very slight foundation represents as a daughter of Charlemagne, and the heroine of a romantic story. Eginhard retired from Court in 830, and soon after his wife, who gave him valuable aid in his work, died. Besides his *Vita Caroli Magni*, there are extant *Annales Francorum*; *Epistolæ* and a history of the translation of the relics of SS. Marcellinus and Peter.

Eglinton, Archibald William Montgomerie, Earl of (1812–1861), was born at Palermo, and succeeded to the earldom at the death of his grandfather, in 1819. He was educated at Eton, and was a Conservative in politics. For a time he devoted himself to the turf, and in 1839 planned the famous Eglinton tournament. He was Lord-Lieutenant of Ireland in the Derby administration of 1852, and again in that of 1858. He was a popular Viceroy, and during his second tenure of office he was made Earl of Eglinton.

Egmont, Lamoral, Count (1522–1568), an illustrious Hollander, who is looked on as a martyr-patriot of the Low Countries. Having entered the army, he did good service under Charles V., and accompanied him to Africa in 1544. Under Philip II. he also distinguished himself in the battles of St. Quentin (1557) and Gravelines (1558). When, under the regency of Margaret of Parma, the nobles under the Prince of Orange conspired, Egmont tried to reconcile his duty to his country with that to the court he had so long served. The Duke of Alva caused the Counts Egmont and Hoorn to be beheaded, more, it would seem, with the politic idea of awing the insurgents than from any real belief in Egmont's disloyalty. While warmly attached to his country and to the members of the discontented faction, he was at the same time loyal to Spain and a staunch Catholic. Between the two stools he came to the ground.

Egret, a name for those birds of the genus Ardea that have white plumage, and develop delicate crests and plumes on the back during the breeding season.

Egypt. *Geography and Physical Features.* Egypt occupies the north-eastern corner of the continent of Africa, and has on the N. the Mediterranean, on the S. Nubia, on the E. the Red Sea, and on the W. the Libyan desert. It is attached to the S.W. corner of Asia by the Isthmus of Suez. Egypt proper extends from the Mediterranean up the river Nile as far as Assuân (24° N.). In ancient times it was divided into two parts, the northern portion (the Delta) being Lower Egypt (now known as *Masr el Bahri*), and the southern portion Upper Egypt (now *el Said*). The old native name of the country was Kemi. With the Libyan and Arabian deserts, Egypt has an area of 394,000 square miles. The only habitable portions, however, are the Delta, the narrow green strip on the banks of the Nile, and the oases. These amount to about 11,800 square miles in all, 6,600 being in the Delta, and 5,200 along the river-banks (reckoning to the first cataract), and around the lake of the Fayoum. The Nile (which is, after the Amazon, the longest river in the world) is the one source of what fertility Egypt possesses. About 3,300 miles of its course are known, and it is navigable (with the exception of two great interruptions) throughout the whole of that distance. The "father of rivers" is formed by the confluence of the White and the Blue Nile at the modern town of Khartoum, and traverses, in a northerly direction, an absolutely barren country, receiving, in its course to the sea—a distance of more than 1,800 miles—one tributary only, the Atbara, on the E. side, about 180 miles N. of Khartoum. Islands occur here and there along its course. The Nile flows into the Mediterranean by several channels, the most important being the Phatnitic mouth, near Damietta (the principal eastern outlet), and the Bolbitinic or Rosetta mouth,

near Rosetta or Reshid (the principal western outlet). The Nile-outlets of the Delta, however, have probably frequently changed their course since ancient times. With the exception of the Delta and the river-banks, the country is very barren, and consists of sand-hills, with oases* here and there. The country was anciently divided into nomes, of which the number varied at different periods. The Egyptian lists mention forty-four, but of these, two in Upper Egypt and three in Lower Egypt are mentioned twice. The principal cities in Upper Egypt were Abu (Elephantine), Ni Amon (No Amon or Thebes), Qefti (Koptos), Tan ta rer (Tentyris, now Dendera), Tin (Abydos), Siaut (Lycopolis, now Assiout), etc.; and those of Lower Egypt Men Nofer (Memphis), Saï (Saïs), Ha ta hir ab (Athribis, now Tel Atrib), Anu (On or Heliopolis), Zoan pi-Ramses (Tanis), Pi-Thut (Hermopolis), Pi-Bast (Bubastis, now Tel Basta), etc. The portions watered by the Nile are of extreme fertility, and the Egyptians early learned to control its course and turn its precious flood, with its fertilising mud, to the best advantage, storing it and conducting it to the fields by means of a network of water-channels. The oases were then, as now, fertilised by means of wells. The period of the inundation lasts from the end of June until the end of October. From this time to the end of February the crops are growing, and harvest lasts from the end of February until the end of June. Occasionally two crops are yielded by the same field in the same season, but they must differ in kind, so as not to exhaust the land. In the winter season the crops are wheat, barley, clover, and broad beans; in the summer season rice, indigo, grapes, cucumbers, melons, and tobacco; and in the autumn season maize, Indian millet, and sometimes sesame. The vegetation, with which the Delta is clothed in June and July, is wonderfully rich and beautiful, the many magnificent trees affording a most agreeable shade from the fierce rays of the sun. Besides the above-mentioned produce, cotton, flax, hemp, lettuce, chicory, sugar-cane, the date-palm (twenty-seven different kinds of dates are usually offered for sale), pomegranates, together with many of the fruits familiar in Europe, are plentiful. Besides the horse (generally of insignificant appearance), the ass, the buffalo, the ox, and most of the domestic animals of Europe are common. Many beasts of prey (jackals, foxes, hyænas, etc.) and birds (including the "sultan-bird" and the "golden snipe") also abound. Crocodiles are gradually disappearing before the march of modern civilisation, but they are still to be found sometimes in the valley of the Nile above Girgeh, and more frequently between the cataracts of Assuân and Wâdi-Halfa.

Recent Discoveries. Egypt has remained known to the world as a land of wonders from the earliest times. The Greeks, when they visited Egypt, were much struck by the pyramids, which they always described, and even imitated in their own country. Herodotus's description of the wonders of this country is well known, and, according to Pliny, the Pyramids were also described by Euhemerus, Aristograrus, Dionysius, Alexander Polyhistor, Antisthenes, and others, besides Strabo, Diodorus, etc. Many Arabian chroniclers have written about Egypt, from El-Mas'ûdi, of Fostât, who died in 956, to 'Abdellatif, a physician of Baghdad, who died in 1232. It is only during the present century, however, that real researches have been made. A great impulse was given to the study of Egyptian by the discovery of the Rosetta-stone in 1799 by M. Bouchard, a French captain of engineers. This monument was found in Fort St. Julien. The first to study this important document was Dr T. Young in 1819. He was followed by Champollion, the celebrated French scholar, who prosecuted his researches with such marvellous success that he may be regarded as taking the highest rank among all Egyptologists. Since his time many workers have come into the field, and, with the researches of such men as Lepsius, Mariette, Brugsch, Ebers, Goodwin, Birch, Renouf, Erman, and others, the science of Egyptology has been placed on a firm basis, though much still remains to be done. The first modern traveller who carefully and successfully examined the Pyramids was Nicholas Shaw, in 1721; and he was of opinion that there was a subterranean communication between the Sphinx and the Great Pyramid. Various other explorers followed, among whom may be mentioned Pococke in 1743, Davison in 1763, Hamilton in 1801. Belzoni† thoroughly explored the interior of the Second Pyramid (that of Chephren) in 1817. He also discovered the tomb of Seti I. at Thebes, and opened the rock-temples of Abu-Simbel. Other eminent explorers were Sir Gardner Wilkinson in 1831, Colonel Howard Vyse and Mr. Perring in 1837 and 1838. Lepsius, the great German Egyptologist, made many important discoveries between the years 1842–45, and found no fewer than thirty pyramids which had been unknown to previous travellers. M. Mariette, director of the Khedival Museum (formerly at Boulaq, now at Gizeh), explored the burial-places of Sakkâra, which yielded many treasures. The Sphinx was first excavated by Caviglia in 1817 at the cost of an English society, and again recently by M. Mariette. Lately many interesting discoveries have been made by Professor E. Naville and Mr. Flinders Petrie, assisted by Messrs. Griffith and Newberry, for the Egyptian Exploration Fund, on the sites of Pithom (Pi-Tum) in Lower Egypt, Tel-el-Amarna in Upper Egypt, etc. This last-named site, which was the capital of the heretic-king Khu-en-aten, is the place where the now renowned Tel-el-Amarna tablets, which are mostly letters concerning affairs in Palestine before the entry of the Jews into the Holy Land, were found. Excavations are still being carried on by the above-named fund, which has done such good work.

Language and Literature. Our knowledge of the Egyptian language dates from the time when

* The oases lie at a considerably lower level than the surrounding country, that of Siwa being nearly 80 feet below the sea-level.

† This celebrated explorer had a most remarkable career, and made many discoveries in the Land of the Pharaohs. His life was one full of romance.

Young and Champollion published their studies of the Rosetta Stone, in 1817 and 1822. This inscription, which is now preserved in the British Museum, is of black basalt. It bears, in three different styles of writing—the sacred hieroglyphic, the popular or demotic, and the Greek language and character—a decree of the priests in honour of

Typo. Etching Co. Sc.

MAP OF EGYPT.

Ptolemy V. Epiphanes (B.C. 204–181), issued when the king was still a boy of 14. The last paragraph of the Greek version tells us that we shall find the two translations, one in the sacred, and the other in the popular language of Egypt, adjacent to it. The Egyptian alphabet was first found by comparing the names of the kings, which are distinguished in Egyptian inscriptions by being enclosed in frames called cartouches. The origin of the Egyptian system of hieroglyphs is lost in antiquity. It consists, however, of an alphabet of about twenty-five characters (mostly pictures of natural objects), and a large number of syllabic characters, also pictures, which stand for the objects represented, the reading of the texts being facilitated by phonetic complements, and a large number of determinatives indicating the nature of the object or action expressed. These determinatives, as may be imagined, have proved to be of immense value in translating the inscriptions and perfecting the vocabulary of this archaic language. The Egyptian language is to a large extent monosyllabic and agglutinative, and its pronouns, verbal forms, and some of the roots, resemble closely the Semitic tongues. Coptic is a modern development of the old Egyptian language. Besides stone, which was largely used for inscriptions, the Egyptians used papyrus, made from a plant now no longer to be found in Lower Egypt, though it is met with farther inland. Egyptian literature consists of historical inscriptions, hymns to the gods, treatises on morals and rhetoric, medical works (containing also charms and incantations), works on geometry, mensuration, and arithmetic; also reports and indictments, registers of gifts to the temples, and of objects received by the Crown or by private individuals. Many contracts in demotic writing also exist. Besides the above, there are novels, such as the tale of the Two Brothers, the tale of the Possessed Princess; also the book of the Lamentations or Sighs of Isis, and the well-known funereal compilation—the book of the dead. Poetry of a heroic nature is represented by the compositions of Pentaur, Amen-em-apt, and others (time of Ramesses II.). Travel is represented by the adventures of Sinuhit when fleeing from his enemies, and the Travels of an Egyptian. Altogether the Egyptians possessed an excellent and very varied literature, which, but for the untoward decrees of fate, might have developed into something of a higher and better class.

History. The history of Egypt can probably be traced back to a more remote period than that of any other nation. Manetho, the Egyptian priest of Sebennytus (now *Semmenûd*) gives thirty dynasties from Menes to the time of Nectanebo II. (340 B.C.), extending over a period of 3,555 (better 3,553) years. The most probable date for the foundation of the kingdom is therefore about 3893 B.C. This primeval monarchy, of which Menes was the first king, followed the mythical period. Menes is said to have been the founder of Mennofer or Memphis, the Biblical Noph (in Hos. ix. 6, Moph), which was the capital until the 6th dynasty (about 2956 B.C.), and attained its greatest prosperity under Menes' son Athothis and his successors. Snefru, the first king of whom contemporary monuments are known, was the founder of the 4th dynasty. He conquered the tribes of the Peninsula of Sinai, and discovered the mines there. Khufu (Cheops), Khâfrâ (Chephren), and Menkarâ (Mycerinus) ruled in succession after him, and were the builders of the three great pyramids of Gizeh. The last king of the 5th dynasty, Unas (Onnos), built the great truncated pyramid ("Mastabat el Faraoun") near Dashoor. With this dynasty the supremacy of Memphis ends for a time, and Elephantine comes to the fore, the principal ruler being Pepi, celebrated for his conquests, his pyramid, and the prosperity of his reign. He was succeeded by the beautiful queen Nitocris, about whom Herodotus tells wonderful stories. New glory came to Egypt with the 12th dynasty, under which the sceptres of Upper and Lower Egypt were united, and a revival in the art of the country took place. Amen-em-hat I. (about 2350 B.C.) it was who conquered the district of Wawat (supposed to be Ollaki), founded the temple of Amon at Thebes, and adorned the other holy places of his land. This king left to his son a document (still in existence) depicting the time and the men, as an admonition to his offspring who was to succeed him. Usertesen (Sesonchosis), his son, continued his father's work, conciliating the people, and restoring the temples. His armies

were successful in Wâdi-Halfa in Nubia, and colonists were sent to work the turquoise and copper mines in the Sinaitic peninsula. Amen-em-hat III. (Gk. Ameris, about 2230 B.C.) constructed Lake Mœris and founded the Labyrinth. He was a peaceful ruler, and the country seems to have prospered under him. During the time of the 12th dynasty Semitic families applied for permission to enter Upper Egypt,* and during the time of the 13th dynasty these immigrations became more frequent, and they became at last so powerful as to obtain possession of Lower Egypt, and founded the dynasties of the Hyksos or Shepherd-Kings. For five centuries they ruled over the country, making Tanis (Zoan) and Avaris their chief cities. The native kings, whom they had driven out, reigned over Upper Egypt. These foreign rulers conformed to the ancient culture of the valley of the Nile, and adopted the titles of the Pharaohs and all the courtly ceremonies of the legitimate rulers of the land. It was during this period that Joseph was sold into Egypt, and the favourable treatment which he, and afterwards his father's house, met with, was probably due to their being of the same race as the Pharaoh then ruling. According to Brugsch, the name of the king under whom Joseph served was Nub, a foreign prince who ruled about 1750 B.C., and the famine itself, which took place under Joseph's administration, is, according to the same authority, that mentioned by an official named Baba in an inscription in which, according to the custom in Egypt, he gives a list of his services to his king and country. The Hyksos dominion lasted for five centuries, one of the last rulers being Apap or Aphophis. This king demanded the cession of an important well from Rasqenen, the king of Upper Egypt, and the result of this was a war of independence which lasted eighty years, and which ended in the establishment of the native dynasty (the 18th) on the throne of the country, the struggle ending by the capture, by Aahmes I. (Amosis or Amasis) of Abaris, after a long siege by land and water. The forces of the Hyksos, numbering 24,000 men, were compelled to retreat, and to seek a new home in southern Palestine (about 1700 B.C.). To this dynasty belong the three Thothmes, the last of whom extended his conquests as far as the vicinity of the Tigris ; and Amenophis III. and IV. The former continued to exact tribute from the nations of Western Asia as far as Mesopotamia, and extended his dominions on the south. He was also a great builder. Amenophis IV. is noted for having returned, doubtless under Semitic influence, to the earlier and ruder worship of the sun, and in accordance with this idea, renamed himself Khu-en-aten, "the reflection of the sun's disc." It is to the reign of these two kings that the tablets in the cuneiform character found at Tel-el-Amarna belong. They throw a flood of light upon Egyptian affairs in Palestine before the entry of the Jews into the Holy Land.

Not inferior in glory to the 18th was the 19th dynasty, to which belonged the earlier Ramessides. The reign of Ramesses I. was not remarkable, but his successor, Seti I. (Meneptah) made campaigns against the Aramaic tribes, who were in league with the Kheta or Hittites, and penetrated as far as the Orontes. He built the Memnonium at Abydos, had a sepulchre prepared for himself, hewn in the rock, at Thebes, and completed the great irrigation-canal in Goshen. Ramesses, his son and successor. he caused to be educated along with the young Egyptian nobility, of whom, it is supposed, Moses was one (Exod. ii. 10). The reign of Ramesses II. was an exceedingly brilliant one. He carried his arms to Donkola on the S., Asia Minor on the N., and the Tigris on the E., and erected monuments of his victories in various parts of the countries he had conquered. Among his buildings may be mentioned the Ramesseum at Thebes, the temples at Abydos, Thebes, and Memphis, and the wonderful rock-hewn temple of Abu-simbel. It is this ruler who is generally regarded as the Pharaoh of the oppression of the Israelites—an oppression due to the fact that the last-named were of the same race as the hated and heretic Hyksos, and confirmed by the discovery by M. Naville of the treasure-city of Pithom, which was built by the Israelites, and the monuments of which bear the name of Ramesses II.* A great literary revival took place during this reign. Meneptah II., who succeeded him, is generally regarded as the Pharaoh of the Exodus. This king was on good terms with the Khita or Hittites, and turned his arms against the Libyans, whom he defeated. The architectural works of his reign are mean, and he was in the habit of carving his own name on the ancient monuments of his predecessors. It is not unlikely that the exodus of the Israelites from Egypt was due to, or facilitated by, external troubles, namely, the people of Canaan throwing off the Egyptian yoke. The residence of the kings of the dynasty to which Meneptah belonged seems to have been Tanis or Zoan, thus confirming the statement in Psalm lxxviii. 43, where God's "wonders in the field of Zoan" are sung. Towards the end of the 19th dynasty troubles occurred in the country, several pretenders to the throne (one of them a Phœnician) appearing, and the worship of the gods being neglected. A revival took place, however, with the next (the 20th) dynasty, the first king of which was Ramesses III. or Ramessu-pa-nuter, "Ramesses the god" (Gk. Rhampsinitus), who began to reign about 1273 B.C.

He warred with the Libyan and Maxyan invaders of his land, and opened, by means of his fleet and the caravan-routes, intercourse by sea and land with India. The monument of this King at Bîbân-el-Mulûk, near Thebes, is one of the finest now extant. With Ramesses XII. the 20th dynasty apparently ends, the throne of the Ramessides being usurped by ambitious hierarchs of Tanis, headed by Herhor, the chief prophet of Amon, who now became king, the legitimate line having been banished to the Great Oasis. This line of priest-kings reigned ingloriously, and were unable to exact obedience from their vassals by force, and tried, therefore, a conciliatory policy.

* It was probably about this time that Abram and Sarai entered the country.

* His mummy is now in the museum of Gizeh.

It is supposed that it was a daughter of a prince of this line that Solomon married, receiving from the prince the many favours mentioned in 1 Kings iii. 1; ix. 16; x. 28. Shishak or Sheshonq I., the founder of the twenty-second dynasty (965 B.C.) is supposed to have been of foreign (Assyrian or Elamite*) origin. This king assisted Jeroboam, one of Solomon's "adversaries" (1 Kings xi. 26, 40) against Rehoboam, the son and successor of the Jewish ruler. Jerusalem was captured (1 Kings xiv. 25–26) and the Temple spoiled. The story of his conquests, with a list of the towns in Judah and Israel which he captured, is inscribed on the south wall of the Temple of Amon at Karnak. Sheshong I. was succeeded (933 B.C.) by Osorkon I., supposed to be the same as the Zerah of 2 Chr. xiv. 9, who invaded Palestine, and was defeated by Asa. The native inscriptions tell us nothing of this king. After a contest between his two sons, the elder, Taklath, ascended the throne (B.C. 900), but, like many of his successors, his reign seems to have been uneventful. Bok-en-ranf (Gk. Bocchoris), of the twenty-fourth dynasty (725 B.C.), tried in vain to arrest the decline of the empire by a new legislation, but the country fell at last into the hands of the Ethiopians. Shabaq, the Biblical So, made an alliance with Hoshea of Israel (2 Kings xvii. 4), and conquered Nubia and Upper Egypt. Sabatok was defeated by Sargon of Assyria at Raphia in 720 B.C. Tirhakah, about 685 B.C., conquered Lower Egypt, and, going to the help of Hezekiah, fought with Sennacherib, King of Assyria, near Eltakeh. Later, he was defeated by Esarhaddon, who took possession of Lower Egypt. Both Esarhaddon and his son Assurbanipali, however, tried in vain to hold the country. Twelve vassal princes (the Dodekarchs), headed by Psammetichus, son of Necho, revolted against the overlordship of Assurbanipali, King of Assyria, and, being successful, ascended the throne, and founded the twenty-sixth dynasty (about 665 B.C.). This king, in order to consolidate his empire, favoured foreigners, especially Greeks, in many ways. This proceeding greatly offended the warrior-caste of Egypt, and they emigrated, therefore, to Ethiopia, and founded there the kingdom of the Sembrides. Psammetichus made war upon the wealthy seaports of Phœnicia, but met with a determined resistance. Necho, his son and successor (612 B.C.), though a warrior, sought also the internal welfare of his country. He began to construct a canal from the Nile to the Red Sea, but discontinued the work on being told by an oracle that it would only benefit "strangers." When the Medes and Babylonians attacked Assyria, he also took the field against the devoted country, and defeated Josiah, the ally of the Assyrians, at Megiddo (2 Kings xxiii. 29). Nineveh having fallen, however, Necho's further progress was stopped by Nebuchadnezzar. who defeated him at Carchemish. Necho afterwards deposed Jehoahaz, whom he imprisoned at Riblah, exacted a fine from the country, and placed Jehoiachim on the throne in his stead (2 Kings xxiii. 31–35). Hophra or Apries (591–570 B.C.) captured Sidon, and marched to the relief of Zedekiah when the latter was attacked by Nebuchadnezzar (Jer. xxxvii. 5, 7, 11). After the capture of Jerusalem by the Babylonian king, Hophra accorded an asylum to the exiled inhabitants. In consequence of a defeat at the hands of the Cyrenians, his army revolted against him, and placed Aahmes or Amasis on the throne. This king had a prosperous reign, though he seems once to have come into conflict with Nebuchadnezzar. On the death of Amasis in 526 B.C., Psammetichus III., his son, was defeated by Cambyses at Pelusium; Memphis was taken, and Egypt was reduced to the condition of a Persian province. Psammetichus was afterwards executed for attempting to organise an insurrection to throw off the foreign yoke. After this period revolts against the dominion of the Persians occurred from time to time, and certain native rulers maintained a precarious independence. The country passed, however, from the rule of the Persians to that of the Greeks, the Romans, the Byzantines, and the Mohammedans, under which last it has remained. The Egyptians were from the first very favourable to Christianity, and this ultimately took the place of the old heathen religion. On the conquest of the country by the Mohammedans, however, a number of Arab tribes settled in the valley of the Nile, and many of the Copts embraced Islâm. Under her Mohammedan masters the country has had a chequered history. Egypt was taken possession of by the French in 1798, but they were compelled by the English to evacuate the country in 1801. Mohammed-'Ali came to the pashalic of Egypt in 1805, and under his reign much improvement in the state of the country was effected. This progress was continued under Said Pasha (1854) and Ismail Pasha (1863), who was raised to the rank of Khedive in 1867. His projects for the development of the country failed financially, and the English and French Governments intervened (from 1875 on) in the interest of the bond-holders. In 1879 an English and a French Controller-General were appointed, with seats in the Egyptian Cabinet and extensive powers. Ismail was deposed and replaced as Khedive by his son Tewfik. A military and nationalist rebellion, headed by Arabi Pasha, was suppressed by English intervention, by the bombardment of Alexandria and the battle of Tel-el-Kebir, July, 1882. As France had refused to join in this intervention, the Dual Control was abolished by the Khedive (1883) and an English financial adviser appointed, without whose advice no important step can be taken. The native army and the civil service are largely controlled by Englishmen. An English army (now 3,300 men) has been stationed in Egypt since 1882, but all parties are pledged to its eventual withdrawal. Tewfik died in January, 1892, and was succeeded by his son Abbas.

Religion. The religious ideas of the Egyptians were chiefly connected with the worship of the sun, in morning-time as Har or Harmachis, at midday as Ra, and in evening or at sunset as Tmu. The sun-god in Egyptian mythology floated in a boat

* According to the form, Sheshonq means "he of Susa," the capital of Elam.

through the sky or celestial ether, and descended at night to the dark regions of Hades, through which he passed. According to the inner teaching of the Egyptian priesthood, Ra was the great Universe, and the other gods merely personifications of his attributes, thus making a kind of monotheism, which was the belief of the initiated. Ra is sometimes called the soul of Osiris, who was, therefore, a form of the sun. Osiris was regarded as the principle of life, a pure and perfect being, personifying the good and the beautiful. The principal of evil was represented by Set or Typhon, brother and rival of Osiris. Lower in the scale were Tahuti or Thoth, god of wisdom; Anubis, son of Osiris, director of funeral rites, etc. Other deities were Khnum or Chnubis, god of fertility; Ma, goddess of truth; Nepthis, wife of Set or Typhon; Safekh, associated with Thoth, and goddess of writing and history; Sekhet, Bast (or Pasht) (with the lion's head), to whom the cat was sacred, personified sexual passion; Isis, Muth, and Athor, though externally regarded as separate, were really three different forms of the same fundamental idea. Isis was sister and wife of Osiris, and the goddess of the good and the beautiful. Muth was the great mother and birth-giver. Athor or Hathor (Hat-Hor, "the abode of Horus") was the consort of Har or Horus, goddess of love and dispenser of the blessings of life. Her sacred animal was the cow, and for that reason she generally appears represented with a cow's head. Constant sacrifices were offered to the gods, all religious rites being celebrated with great pomp, and on such occasions a great deal of food was consumed or given away. The priests and their families drew rations from the temples, and the priests of the Pharaohs were supported at the charge of all the temples. In addition to the priests, there were four orders of prophets, those of ability being promoted from the lower to the higher. Like the Assyrians, the Egyptians were exceedingly religious, invoking their deities in almost every inscription, and all the acts of the rulers are attributed to divine assistance.

The Arts. The Egyptians excelled greatly in architecture, sculpture, painting, engraving on stone, agriculture, and many industrial arts. The country was full of magnificent architectural triumphs such as no other nation could show. Their temples were vast structures of hewn stone, built upon the grandest scale, and dwarfing the Greek on comparison. Gigantic columns, with lotus or papyrus capitals, towered to a great height, often reaching 60 feet. Sometimes the temples of the gods were hewn, as at Abu-Simbel, in the solid rock. Bas-reliefs were to be found everywhere in these structures, and were brightly coloured. Scenes of devotion, pictures of mythological import, and representations of battles, tribute-bearers, vassals, captives, appear in profusion. Not less successful were they in sculpture in the round, as is shown by the large number of still extant statues of kings, divinities, and private individuals. No difficulties baffled them; the hardest granite, as well as the softest limestone, were carved into the required shape, according to the canon of proportion which was observed by the sculptors. There is certainly a great sameness about their work, but the few portrait-statues which are known show us what the Egyptians could do when they freed themselves from the trammels of their rigid canon. Besides these monuments, which will probably testify to their skill as long as a civilised nation inhabits the earth, examples of their carpentry exist such as would not disgrace our own time. Specimens of pottery with the celebrated blue and green glaze are also to be seen in our museums; whilst as artificers in bronze, and metals in general, they were probably unsurpassed. Models of houses show what their habitations were like; models of funeral boats indicate faithfully how they performed the sacred duty of carrying their dead to the last resting-place, in the tombs on the banks of the Nile—Memphis, Abydos, or Gournah. The Egyptians were excellent weavers and good agriculturists; and the annual inundation, obliterating as it did all landmarks, necessitated a knowledge of geometry (land-measuring).

Manners and Customs. In domestic life the Egyptian was much attached to his wife and children. Egyptian women seem to have been always the equals of the men, having the same rights and privileges. Both sexes sat, when at meals, at table—either on chairs or on the ground, never reclining as did the Greeks. Children under the age of puberty went undressed, but on reaching that age assumed clothes, and wore a peculiar lock of hair on the left side of the head. Men wore a short fluted garment round the loins, but persons of high rank wore garments of fine linen which reached as far as the ankles, and were provided with full sleeves. The wearing of sandals became general (with some exceptions) after about 3000 B.C., and they were made of leather, palm-fibres, or papyrus (the priests wore only the last-named). The hair and beard were generally shaved. Both men and women wore collars of beads and chains of gold around the neck, as well as armlets and bracelets. As a nation they were very polite and hospitable.

The belief in the immortality of the soul led to the practice of embalming the dead. In this process all the viscera and softer parts of the body were removed, and the body itself was soaked in various salts and resins. Bandages of linen were then carefully wound around it, and it was placed in a gaily-painted and often elaborately-gilded coffin, or a richly-sculptured sarcophagus. After the performance of the service for the dead, hired mourners made lamentation, as is usual in the East. Having been placed aboard a funeral boat, it was floated down the Nile to some favourite cemetery, and consigned, with numbers of small porcelain figures called *ushabti*, to the family tomb. A copy of the Ritual or Book of the Dead was placed with the mummy before it was put into the coffin. At the religious festivals, which took place at stated periods, the arks of the gods were carried in procession, sacrificial offerings were placed on the altars, and hymns and prayers were chanted to the gods. All things connected with temples and worship were in the hands of the priests and priestesses, and the high priest of Amon at Thebes (who was also called the chief prophet) was second

only to the king. Beneath the prophets was an order called the divine fathers, and sacred scribes acted as clerks and kept the accounts. Each temple had servants and slaves attached to it.

Present Condition. The ancient kingdom of Egypt is now governed by the Khedive, whose suzerain is the Sultan of Turkey. The two divisions of Upper and Lower Egypt are each divided into seven provinces, each province being governed by a Mudîr, whose duties are very multifarious. The principal modern towns are Cairo (the capital), at the lower apex of the Delta; Alexandria, Damietta, and Port Saïd (on the coast); Mansura, Mehallet el Kebîr (both in the Delta), Minyeh, Melawi el 'Arish, Siût or Assiout, Keneh, Assuân, etc., in the southern provinces. Iswailîya, Port Said, and a village near the Serapeum railway-station, owe their origin to the digging of the Suez Canal. The land by the Nile is as fruitful as of yore, and irrigation is ensured by a system of water-wheels (*sakîyeh*) moved by animal power, and by the well-known *shâdûf*—a bucket attached to the end of a beam (which is fastened in the middle to a post), and counter-balanced by a weight. Efforts are being made by the English administration to improve the irrigation by a system of *barrage*, which will doubtless have an excellent effect. The Delta is now covered with a network of railways (the first of which was constructed by Stephenson in 1850, under Abbas Pasha), which connect all the important towns, and of which a branch runs along the valley of the Nile as far as Assiout. The dryness of the air, and the beauty of the climate, attract a large number of visitors during the winter months, many of them being invalids in search of health. The climate during the summer is too hot to tempt the ordinary tourist.

Ethnology. Modern Egypt forms ethnologically an extension of the Arabian peninsula, at least so far as regards language, religion, and the normal section of the population. Arabic has long been the universal language of all the natives; Islâm is almost their exclusive religion, and the pastoral steppes and oases are mostly inhabited by tribes of pure Arab descent. But the great bulk of the settled agricultural classes still belong fundamentally to the old Egyptian stock, which is directly represented by the Copts [Copts], and which during the former political vicissitudes of the country was little affected in the rural districts by contact with the Persians, the Macedonian Greeks (Ptolemaic dynasty), the Romans, and the Byzantine Greeks. Under its successive conquerors Egypt preserved its nationality, usages, language, and religion almost intact down to the Arab invasion of the 7th century, which forms the starting-point of a fundamental change in these respects. The old religion and language were rapidly replaced by those of the Mohammedan conquerors, while a more gradual and less complete fusion took place between the Hamite (Egyptian) and Semite (Arabian) ethnical elements. In this respect the process of assimilation was reversed, and the Arab intruders became merged in the old agricultural classes. Hence the startling resemblance often presented by the Arab-speaking Mussulman Fellahin (peasantry) to the primitive Egyptian types, as figured on the very oldest monuments of the Nile valley. On these monuments are represented two well-marked types—one delicate, noble, and regular, in the European sense (Caucasic); the other more coarse and vulgar, with tumid, almost everted lips, and small nose, as if from the dawn of history a fusion had already taken place between the Semitic intruders and the indigenous Negro inhabitants of the Nile basin. It is the latter type that survives in the Fellahîn, and in a still more marked degree in the Copts. The Fellahîn (from the Arabic root *falaha* = to toil, to till) still form at least three-fourths of the whole population, which is estimated (1892) at 7,500,000, including about 1,000,000 sedentary Arabs, Turks, Soudanese, and Nubians; 250,000 nomad Arabs and Bejas; 40,000 Greeks: 20,000 Italians; 20,000 Jews; 16,000 French; 10,000 Armenians; 10,000 Austrians and Germans; and 7,000 English. The nomad Bejas [Beja] occupy the steppes between the Nile and the Red Sea from about the parallel of Kosseir to the Nubian frontier; like all the Bejas, they are divided into a large number of tribal groups, some of Beja, some of Arabic speech, all Mussulmans, stock-breeders, and caravan conductors, and collectively known as *Ababdeh*. All the rest of the eastern and the whole of the western steppes and oases are held by full-blood Arab Bedouins, some of whom have their descent from the first invaders (640 A.D.), but most of whom are more recent arrivals. Their tribal divisions are very numerous, the most important being the Hawaitât Terrabin, Amrân, Aiaideh, Hawâsin, east of the Nile; and the Aulad-Ali, Hanâdi, Goâbi, Aulad-Suleimân, Azaleh, Fergân, and Tarhôna west of the Nile. Many of these western Bedouins now lead almost sedentary lives, and combine husbandry with pasturage, hence are regarded by the nomads of the wilderness as little better than the despised Fellahin. But their Arab blood is easily recognised in their swarthy complexion, small bright eyes, wiry figures, energetic spirit, and traditional usages.

Egyptian Vulture (*Neophron percnopterus*), called also Pharaoh's Chicken or Hen, a vulture, about 30 inches long, found in the S. of Europe, ranging into Asia and the N. of Africa, and abundant in Egypt. The general plumage is white, the wings black, and the bare part of the face yellow. It is a very foul feeder and valued as a scavenger.

Ehkili, a term of unknown origin applied by the inhabitants of Mahrah, Makalla, and some other districts of Hadramaut, S. Arabia, to their language, which is of great philological interest. It differs greatly from current Arabic, and represents, in a corrupt form, the primitive Himyaritic speech of Arabia, which survives also in the Tigré and other dialects of Abyssinia on the opposite side of the Red Sea. Ehkili is consequently one of the most primitive dialects of the primordial Semitic language, and in it are composed the numerous rock inscriptions scattered over S. Yemen and Hadramaut. From these imperfectly-deciphered inscriptions and from the specimens of Ehkili

collected by Fresnel and others, it appears that Himyaritic differs more from Arabic than Arabic does from Hebrew, with which language it has much in common. (Fulgence Fresnel, *Note sur la langue himyarite* in *Journal Asiatique*, vi. 79 ; H. J. Carter, *Notes on the Mahrah Tribe of Southern Arabia* in *Journal of Bombay Asiatic Society*, ii., 1848, p. 339.)

Ehrenbreitstein ("the Broad Stone of Honour"), a Prussian fortress on a height upon the right bank of the Rhine opposite Coblentz, with which it communicates by a bridge of boats and an iron railway bridge. The French blew up the fortress in 1801, and had to pay for its rebuilding in 1816. The fortress will contain a garrison of 14,000, and a year's stores for an army of 60,000, and there is a well communicating with the Rhine. On three sides the fortress is inaccessible.

Eider, a river of Prussia rising near Kiel, and separating Schleswig from Holstein, and falling after a course of about 100 miles, through two-thirds of which it is navigable, into the North Sea. The Schleswig-Holstein canal connects it with the Baltic at Kiel.

Eider Duck (*Somateria*), a genus of marine ducks with five species, breeding socially in Arctic and sub-Arctic regions. The bill is small, with a horny nail at the tip, and extends up on the forehead, where a central line of feathers divides it; tail short and pointed, hind toe lobed. The tertiaries are long and generally curved outward so as to overlap the primaries. The Common or True Eider Duck (*S. mollissima*) is abundant in the Arctic circle in both hemispheres, and sometimes breeds as far south as the Bay of Fundy and the Fern Islands. The male—about two feet long—is slightly larger than the female, and is also more brilliantly plumaged, especially during the breeding season, when the crown of the head is bluish-black, the tail and under surface black, the nape and cheeks siskin-green, the neck and upper surface with a good deal of white, which is replaced by darker hues in the autumn. The young of the year and the females are clothed in rusty brown, barred and spotted with a darker shade. The bill and feet, greenish. The King Eider or King Duck (*S. spectabilis*) is a native of the extreme north of Asia and America, some breeding as far south as Iceland and the Faröes. It occurs also as a rare British visitor. It is about the same size as the Common Eider, which it greatly resembles, but the male has the top of the head grey and the breast flesh-coloured, and there is less white on the back; the bill and feet are rufous brown. These birds are economically important, and both are domesticated in northern regions, the former to a much greater extent than the latter. Their flesh, like that of most sea-birds, is oily, but in the domesticated races this has been to some extent overcome by a mixture of meal with their natural food, which consists of molluscs and crustaceans. The eggs are eaten, and those of the King Duck are of delicate flavour. But it is for their fine grey down, so much used for lining coverlets and quilted garments, that these birds are chiefly valued. Some of it is, of course, used on the spot where it is gathered, as are the skins for underclothing, but the greater part is sent southward. Iceland and Norway are the chief seats of eider breeding. As soon as the eggs are laid the female plucks the down from her breast to cover them. The nest is then stripped by the collectors, and the bird lays other eggs, which she covers as she did the first, and these, with their covering, are also taken. The third lot, which the male helps to cover, is left, lest the birds should desert the nest. The quantity annually gathered from each nest is, when cleansed, about a quarter of a pound. Down deposited by the female is called "live-down;" that taken from dead birds is of inferior quality, and is known as "dead down."

Eifel, a barren plateau of undulating land in Rhenish Prussia between the Rhine, the Moselle, and the Roer. It is hilly and rugged in the W., and in the N.W., where it joins the Ardennes, but slopes down to the Rhine and the Moselle. The height varies from 1,500 to 2,000 feet, and a ridge of mountains crosses the centre. The formation is Lower Devonian Silurian, with Eifel limestone, containing many fossils, and over is a Triassic formation containing metals. Extinct craters, basalt lava, tufa, and pumice bear witness to volcanic action. There is little agriculture, but some wine and spirits are produced.

Eiffel Tower, a well-known iron structure designed and erected by Gustave Eiffel, the French engineer, on the Champ-de-Mars in Paris. It was built in 1887–89 at an estimated cost of £200,000, of which £60,000 was granted by the Government and the balance provided by the engineer. He holds a concession for 30 years, after which time it passes to the State. It is a structure of open ironwork on a square base tapering upwards with curved outline to a height of 985 feet. There are three storeys, and the passage to the top is effected by lifts. The total weight of iron employed in its construction is about 6,860 tons.

Eilethyia, a city of ancient Egypt below Edfu, on the right bank of the Nile, sacred to the goddess Suben—later identified with Lucina—the patroness of Upper Egypt. There are rock-tombs hewn in the rock, and dating from the 13th dynasty and later. One has records of the wars against the Hyksos in the 18th dynasty. There are two very ancient temples, one to Ra, and the other to the local deities, and a temple of the time of the Ptolemys to Lucina. The city was an important outlying fortress.

Eimaks (properly *Char Eimak*, *i.e.* the Four Tribes), the inhabitants of the western part of the Paropamisan mountains between Kâbul and Herat, N. Afghanistan. The four divisions are:—*Taemûni*, S. slope of the Siah Koh, about Gor; *Hazâra Zeidnat*, Kalao Nao district, about the head waters of the Murghâb; *Taemûri*, W. of Herat, now mostly within the Persian frontier; *Zûri* (*Sûri*), on the hills E. of the road from Farah to Herat. The Eimaks are a mixed Mongolo-Tartar people,

who now speak a mediæval form of Persian, and who claim pure Mongol descent. Many still spoke Mongol in Sultan Baber's time (16th century), and the historian Abul Fazl regarded them as the remains of the hordes commanded by Manku Khan, grandson of Jenghiz Khan. In any case, they are of the same race as their eastern neighbours, the Hazâras, though hostile to them, being of the Sûni (orthodox) sect, whereas the Hazâras are Shiahs. The Eimaks still live almost entirely in "urds," or camps, each of which is administered by a ket-khoda dependent on the khan or chief ruler, who pays reluctant tribute to the Amîr of Kâbul; total population about 450,000. (Col. C. M. MacGregor, *Afghanistán*, Calcutta, 1871, pp. 245, *et seq.*)

Einsiedeln, a Swiss town in the canton of, and 8 miles N.E. of the town of, Schwyz. It is situated upon a plateau 3,000 feet above sea level, and is surrounded by mountains. It has a seminary, and a Benedictine abbey, which was founded in the 10th century, and has a good library of 26.000 volumes. There is a chapel of St. Meinrad, and a colossal image of our Lady. The miraculous image attracts many thousands of pilgrims, and there is a brisk trade in beads, books, and other souvenirs. Zwingli is said to have emptied the convent in 1517 by his sermons against the monastic life. The district produces good horses, and there is a trade with Zurich in wood and turf. The chief industries are dyeing and cloth and wool manufacture.

Eisenach (the *Isenacum* of the Romans), a town and head of a district in the Grand Duchy of Saxe-Weimar, at the junction of the Hoersel and the Nesse, about 48 miles W. of Weimar. It is situated in a valley, surrounded by wooded hills. There are two good churches and a castle, once inhabited by the princes of Saxe-Eisenach. On the height above is the Castle of Wartburg, inhabited by Luther after the Diet of Worms, and his room, chair, table, and writing-desk are still shown. There is some weaving and manufacture of fustians and coarse woollen goods, and there are oil, powder, and seed mills. Sebastian Bach was born here in 1682, and a statue was erected to him in 1884.

Eisleben (anciently *Islabia*), a Prussian town in the province of Saxe, capital of Mansfeld, on the Bose, about 20 miles N. of Merseburg. Luther was born here, and in the church opposite the house in which he was born is a pulpit from which he used to preach. There are copper and silver mines, foundries, and manufactures of saltpetre, vitriol, and Eisleben green. There are also breweries, and tobacco is manufactured.

Eisteddfod (from a Welsh word meaning a sitting) is the name of a Welsh congress called together for the purpose of musical, poetical, and literary competition, and having for its main object the keeping alive of the national language and customs. In former times the places of meeting were in different districts of Wales according to the place of the bards. Commissions from the kings of Wales, and later from the kings of England, appointed the judges down to 1568, when the custom of holding Eisteddfodau died out, to be revived in recent years. In 1887 an Eisteddfod was held in London, and Englishmen were astonished, if not edified, to see the solemn opening of the session inaugurated by the Druids in Gorsedd, each on his proper stone in the circle.

Ejectment, the name of the action in which a plaintiff formerly sued to recover possession of real estate, such as land and houses. By the "Common Law Procedure Act. 1852," the title of such action was altered, and the proceedings therein much simplified. It is now known as an action "for recovery of land." The proceedings of the old action of ejectment were of a very technical and abstruse character. the names of "John Doe" and "Richard Roe" (fictitious persons in such action) being still familiar to many. [Recovery of Land.]

Eka, -boron, -aluminium, names applied by Mendeleef to elements, then undiscovered, but whose existence, on the basis of the Periodic Law (q.v.), he predicted and described. The first was recognised in the element *Scandium* and the second in *Gallium*, both of which were discovered a few years after Mendeleef's prediction.

Ekaterinburg, a Russian town on the Isset, in the government of Perm, 170 miles S.E. of the town of Perm, and upon the east side of the Ural mountains, and in the Ural mining district. It was founded in 1723 by Peter the Great, and is well built. It has a mint, custom-house, mining school, hospital, and botanic gardens. Besides mining, metal-working, and cutlery, there is much polishing and engraving of gems. A bridge over the Isset connects the two parts of the town.

Ekaterinoslav, a Russian town, capital of the government of the same name, on the right bank of the Dnieper, 250 miles N.E. of Odessa. It was founded in 1787 by Prince Potemkin as a summer residence for Catherine II. It is the see of an archbishop, and has a cathedral and a library. The government contains 26,148 square miles.

Eland (*Oreas canna*), the *Impoofoo* of the natives, a large ox-like antelope living in small herds in Southern and Central Africa, where it is hunted for sport, for its excellent beef-like flesh, and for its hide, valued by the Dutch colonists for making traces. A full-grown bull stands about six feet high at the withers, which are elevated, though there is no "hump," and has a deep dewlap, and a short, stiff mane. Horns, straight and spirally ringed, are present in both sexes, and the tail is tufted. The general colour is fawn, but this varies considerably with age.

Elanet, a genus of small raptorial birds with five species widely distributed in tropical and sub-tropical regions. They are allied to the kites, but differ chiefly in having the tarsus partially feathered. Their diet is, for the most part, insectivorous, but small birds and reptiles are often taken.

Elaps. [Coral Snake.]

Elasmobranchii. [Cartilaginous Fishes.]

Elasticity is that property of most strained substances by which they may recover their original shape and size when those forces which produce the strain are removed. There are different kinds of strain, such as strain in *shape*, *bulk*, or in *length*, and consequently different kinds of elasticity. Thus, a substance may be changed in shape without having its volume altered; if it possess an elasticity that will bring it back to its original shape when the stress is removed, it is said to possess *rigidity* or *elasticity of form*. The characteristic of a fluid is that it possesses no rigidity; any small force may in course of time deform it, and a removal of that force will not necessarily lead to a renewal of the original form. Then a substance may be changed in volume by the application of stress. A sphere of gas, for example, may be compressed into a smaller sphere. If the original conditions of force be obtained, the gas will recover its former size; and it is said to have an *elasticity of bulk* [BOYLE'S LAW], a property that is possessed by nearly all solids, liquids, and gases to a greater or less extent. If a stress be applied in one direction only to a substance, as when a weight is hung at one end of a steel wire that is supported at the other end, change of dimension in that direction will take place; the wire will be extended. Removal of the weight will cause a more or less complete return to the original length. This is due to an *elasticity of length*, and it may be studied without regard to the change in the lateral dimensions of the wire or other material so strained. As a matter of fact, the wire will increase in bulk slightly, though it contracts a little laterally. In all cases of solids an excessive strain will so alter the substance that it cannot return to its original shape and size. Thus, copper wire may be permanently extended if the applied forces are sufficiently large. The material is then said to have a *permanent set*, or to have been stressed beyond the elastic limit. An elastic limit cannot be fixed for a fluid. The numerical measure of elasticity is given by a *modulus* for each material, *i.e.* the quotient of stress divided by strain. *Stress* is generally measured in pounds per square inch, and *strain* as the ratio of the change in dimension to the original dimension itself. Thus, if a length L is extended to $L + l$, the strain is $l \div L$. Hooke's law states that up to the elastic limit stress is proportional to the strain it produces. The following are the average moduli of elasticity of length and of rigidity for the more important materials employed in engineering, together with their elastic strengths in tension. All are in pounds per square inch:—

Material.	*Elasticity.*	*Rigidity.*	*Elastic Strength.*
Cast-iron ..	18,000,000 ..	6,500,000 ..	10,500
Wrought-iron ..	29,000,000 ..	10,500,000 ..	24,000
Steel, untempered	30,000,000 ..	11,000,000 ..	80,000
Copper	36,000,000 ..	13,000,000 ..	190,000
Oak	1,500,000 ..	82,000 ..	—

If inelastic bodies impact directly on each other, they will remain together without rebounding. Elastic bodies, on the other hand, exert a mutual force of restitution when they collide, and this produces a separation. [IMPACT.]

Elastic Tissue. [CONNECTIVE TISSUE.]

Elateridæ. [FIREFLIES, WIREWORMS.]

Elaterite, elastic bitumen or mineral caoutchouc (CH_2), sometimes containing oxygen, is a soft, flexible substance, with resinous lustre, strongly bituminous odour, blackish, yellowish-brown, or reddish colour, and specific gravity of ·8 to 1·2. It occurs at Castleton, Derbyshire; near Edinburgh; Montrelais, near Nantes; Neufchâtel, Switzerland; Zante; Woodbury, Connecticut; and elsewhere.

Elaterium, the dried precipitate from the juice of the pulp surrounding the seeds of the squirting cucumber (*Ecballium elaterium*). This plant is a native of South Europe, but is cultivated at Hitchin, Market Deeping, Mitcham, and elsewhere in England. It is a prostrate annual without tendrils, and produces a small elliptical gourd, which when ripe separates violently from its stalk, ejecting its brown seeds and the pulp surrounding them. To prepare the drug, the fruit is sliced and pressed, and the juice is filtered. It is made into light, thin, friable, greenish cakes, bitter in taste and tea-like in smell, and is imported from Malta in boxes containing from 50 to 120 ozs. This is often, however, adulterated with starch, that prepared in England being better. The officinal preparation of this drug is the compound elaterium powder, *pulvis elaterini compositus*, dose ½ gr. to 5 grs. It acts as a powerful hydragogue purgative, and should only be administered under medical advice.

Elaters, the name both of fusiform cells in the spore-capsules of certain liverworts (q.v.), with spiral wall-thickening, which assist in the scattering of the spores; and of the four spirally-coiled bands with rounded ends formed by the splitting of an outer coat of the spore in the horse-tails (q.v.). These latter are attached at one point to the spore and coil hygroscopically, thus serving to keep together the spores in small groups, as they escape from the sporangium.

Elba (formerly *Æthalia* or *Ilva*), an Italian island in the Mediterranean, separated from the mainland by the Piombino channel. It is 7 miles from Italy, and 30 from Corsica. The isle is mountainous, the greatest height being about 13,000 feet. The forts of Porto-Ferrajo and Porto Longone are fortified and garrisoned. There are no rivers, but plenty of springs. The climate is good and the land fertile, but agriculture is neglected. Many of the inhabitants are engaged in the sardine and tunny fisheries. There is good iron, and the mines were much worked in the time of the Romans. Silver, marble, granite, and salt are also produced, and there is good fruit and wine. By the Treaty of Amiens (1802) Elba was incorporated in France, and in 1814 the sovereignty was given to Napoleon, who remained there nine months. Vermuth and a particular liqueur are manufactured.

Elbe, THE, one of the chief rivers of Germany,

takes its rise in the junction in Bohemia of several streams from the Riesengebirge, the two final branches being the Weisswasser and the Elbebach. It first flows S., with a swift current, through a wild, rocky valley, widens between Josephstadt and Nimburg, again narrows and passes through a valley between the Lausitzer gebirge, and the Erz gebirge, enters Saxony, and finally takes a N.W. course into the North Sea separating Hanover from Mecklenburg, Lauenburg, Hamburg, and Holstein. Above Hamburg the stream is divided by several islands, but unites five miles above the town. The estuary at Cuxhaven is impeded by sand-banks, but of the course of 780 miles, 470 are navigable. The Upper Elbe basin is mountainous, but the lower basin is flat and sandy, and abounds in morasses and lakes. Salmon, eels, and sturgeon are plentiful. The chief tributaries of the Elbe are the Iser, Black Elster, and Havel on the right bank, the Moldau and Saale on the left bank.

Elberfeld, a Prussian town in the government of Düsseldorf, and about 20 miles E. of the town of that name. It is situated on the banks of the Wupper, and is in a valley enclosed by hills. It forms a continuous town for almost six miles with Barmen, and is the great centre of the cotton trade of the Rhine provinces. It rose into importance from the blockade which followed upon the French Revolution, and its coal and many streams gave facilities for the manufactures then established. There is much spinning and weaving, and manufacture of silk, velvet, cotton, ribbon, nankin, lace, and embroidery. It supplies Glasgow with much Turkey red dye. There are no very important buildings, but the town hall has some frescoes.

Elbing, a Prussian town upon the river of the same name, near its entrance into the Frische Haff, 32 miles S.E. of Dantzig. The river is connected with the Vistula by the Kraffohl Canal, and the harbour has a good mole of over 3,000 yards in length. There are ship-building yards, and manufactures of cloth, leather, and tobacco, among other things.

Elbœuf, a Norman manufacturing town in the department of Seine-Inférieure, about 12 miles S.W. of Rouen, on the left bank of the Seine. There is a good suspension bridge to the village of St. Aubin. Its industries date from long back, and Napoleon spoke of it as a "hive where everyone works." It has steam communication with Paris, Rouen, and Havre, and is one of the chief centres of the French woollen manufacture, which is carried on here in all its branches. There are two Gothic churches—St. Stephen's and St. John's, the former of which has some good old glass.

Elburz, the highest summit of the Caucasus, in lat. 43° 21′ N., and long. 40° 5′ E., about 140 miles N.W. of Tiflis, is situated on a high plateau. Elburz itself is over 18,000 feet high and is of volcanic origin, and is easy of access.

Elche, a Spanish town in the province of Alicante, about 15 miles S.W. of the town of Alicante, and near the left bank of the Vinalapo. The town was anciently called Allici, and there are many Roman remains. There is a fine church, a town hall, and a feudal castle, and the general appearance of the town is Moorish. It is approached by a fine bridge.

Elder (*Sambucus nigra*), a common British tree of small size belonging to the order *Caprifoliaceæ*. It produces stout subangular shoots with copious pith, which is used in electrical apparatus and in section-cutting in the biological laboratory. Its leaves are opposite and pinnate, and are used to give a green colour to oil and unguents. The flowers are small, but form corymbose cymes a foot across, with five main branches, each flower having a five-lobed corolla, five stamens, and three carpels. They contain a volatile oil, from which elder-flower water, used as a lotion or perfume and in confectionery, is distilled. The globular, purplish-black berries are used in British wine, and, it is said, as an adulterant of port. The older wood is white and hard, and is used by shoemakers and turners. Much legendary lore attaches to the tree, Judas being said to have hanged himself on an elder and the cross to have been made from the same species.

Elder, as the name implies, a man of certain age, who in consequence of his age is supposed to possess wisdom as a result of his experience. The senators of Rome were originally supposed to answer this description. Among the Jews, Moses took seventy elders to aid him in the government; so in some modern churches, especially in the Presbyterian, elders are elected to aid the pastors in matters of church management and discipline.

Eldon, John Scott, Earl of (1751–1838), an English Lord Chancellor, born at Newcastle-on-Tyne, where his father was a coal merchant. He was educated—as was his brother William, afterwards Lord Stowell (q.v.)—at Newcastle grammar school and at University College, Oxford, where he obtained an English Essay prize and a fellowship, which latter, however, he had to give up at the end of his year of grace owing to his marriage with Bessie Surtees, with whom he eloped. The friends on both sides forgave them, and came to their aid; but Scott had a hard struggle with poverty both before making up his mind for the bar and during the early part of his legal career. In 1776 he was called, and in 1780 made a name. In 1782 he was K.C., and the next year he entered Parliament and supported Pitt, who made him Solicitor-General in 1788. In 1793 Sir John Scott was made Attorney-General, and six years after Chief Justice of the Common Pleas and Baron Eldon. In 1801 he was Lord Chancellor, and in 1807 he again held the office, which he retained for ten years, through all the difficulties caused by the madness of George III., being created earl in 1821. He resigned at the appointment of the Canning Ministry. He has had many traducers, who have ridiculed his ready tears in presence of his royal master, and questioned his political honesty. He

was a sound and able lawyer, though his slowness in coming to a decision led to a block in his court and to much suffering and injustice. He himself tells us how, when travelling up as a young man from the North, he adopted the motto "*Sat cito, si sat bene*," and had misgivings as to whether he ought not often to have reversed the principle. His delays are said to have been the chief motive in determining Dickens to write *Bleak House*.

El Dorado (the land of gold), a supposed region of America in which gold and jewels were as common as stones and pebbles. It was to the adventurers and explorers of the infancy of colonisation what the philosopher's stone and the elixir of life was to the alchemists of the same period. "Aim at a vesture of gold and you may get a sleeve," says the old proverb, and searches after El Dorado resulted in the acquisition of some of our most valuable colonies. It was Orellana, the companion of Pizarro, that first set the stone rolling in this direction, and it is not impossible that he had some groundwork for his ideas in rumours of that Central American civilisation whose remains form one of the puzzles of the present day.

Eleatic School, a school of Greek philosophy which took its name from the town Elea, in Magna Græcia—the Greek settlement in Southern Italy—of which place the three chief Eleatic philosophers —Parmenides, Zeno, and Leucippus, were natives. The school was founded, according to tradition, by Xenophanes, who came to Elea from Greece. Their method was synthetic as opposed to the analytic Ionian system. Instead of searching for a unity of principle in the varying phenomena of life, the Eleatics started with the idea that the one or absolute alone is real, and in their later development denied that existence can be truly predicated of variety.

Elecampane (*Inula Helenium*), a perennial composite plant, native of Western Asia and Southern and Central Europe, occurred as an escape in England. Its stem is from three to five feet high, and its heads of yellow florets are two inches across. The root, the *radix inulæ* of pharmacy, is thick, branched, mucilaginous, aromatic, and bitter, with a camphor-like smell. Besides *inulin* (q.v.), an isomer of starch, it contains two crystallisable substances, *helenin* ($C_6H_8O_0$) and *alant-camphor* ($C_{10}H_{16}O$). It was formerly used as a medicine, and, when preserved in sugar as a condiment, being an aromatic tonic thought good for coughs, stitch, etc. It is now mainly used in the manufacture of absinthe and in veterinary medicine.

Election, the choosing any one or more for an office out of other competitors. The doctrine of election is founded on the civil law, and is the duty imposed upon any one or more to select between two alternative claims in cases where it is clearly intended that he or they should not have both. The person who takes has his selection of one, but cannot enjoy both.

Electra (*Laodice* in Homer) was the daughter of Agamemnon and Clytemnestra, and sister of Iphigenia and Orestes. After her father's murder, she sent her brother to Strophius, king of Phocis, and urged him against Clytemnestra and her lover Ægistheus. Orestes and his friend Pylades afterwards took vengeance for the death of Agamemnon. The story has formed a theme for Æschylus, Sophocles, and Euripides, and for modern dramas and operas.

Electric Bells are those that are set ringing by means of an electric current. The ordinary type of *trembler-bell* now so generally adopted in houses consists of a small electro-magnet that will attract an iron keeper whenever a current is passed round the coils of the magnet. The keeper is so placed that when it is attracted the electric circuit is broken, the current stopped, and the keeper pulled back by a spring. As soon as it is so pulled back the circuit is closed, and the current flows round the magnet, only to be broken when the keeper is drawn up. Thus an intermittent current flows round the coils, and the keeper oscillates backwards and forwards so long as the battery is kept in circuit. The keeper is attached to the hammer of the bell, and its oscillation causes a series of taps. The battery is put in circuit usually by pressing a small button which by joining two wires connects the battery with the bell. Usually Leclanché cells are used for these bells, for they last very well, and supply a powerful electromotive force if used only occasionally. Electric bells adapt themselves readily as alarums. There are electric fire-alarms, for instance, which start ringing when the temperature of the protected region becomes high. This ringing is effected by an electric circuit being completed at that juncture; two wires may remain separate so long as they are cool, but any undue expansion by heat may cause them to touch each other, and so close an electric circuit. The same principle of forming an electric circuit is used for burglar-alarms and similar contrivances.

Electric Clocks are those whose motive-power is supplied by electricity. The pendulum may be acted on by an electro-magnet so arranged that it pulls the pendulum first one way and then the other; no weight or spring is then required. Or the weight may be lifted up periodically by an electric current, thus rendering the clock self-winding. A very useful application of electricity to clocks is the rendering of a number of them perfectly synchronous. If a series of similar clocks with pendulums of equal length be worked by the same current, they can be made to tick simultaneously, and so record the same time always. Such an arrangement is specially useful on railways.

Electric Fishes are those furnished with peculiar muscular organs, capable of accumulating electricity and communicating it in the form of shocks to other animals, for the purpose of killing or stunning their prey, or as a means of defence against the attacks of their enemies. Professor

Huxley describes these organs as being always composed of nearly parallel partitions of connective tissue, enclosing small chambers containing cellular structures termed the electrical plates, in one face of which the final branches of the nerves that supply the organ are distributed. The face on which the nerves ramify, when the discharge takes place, is always negative to the other. This surface is inferior in the Electric Rays (*Torpedo*), and the shock passes from below upwards; it is anterior in the Electric Cat-Fish (*Malapterurus*), and posterior in the Electric Eel (*Gymnotus*), and in the former fish the shock passes from the head towards the tail, and in the latter in a contrary direction. These organs may be traced in an ascending series from those in the Common Rays and in the Nilotic genera Mormyrus and Gymnarchus (where they are without electrical functions, but evidently representing a transitional condition from muscular substance to electrical activity), through the Electric Cat-Fish and the Electric Rays to their highest development in the Electric Eel, a shock from which is said to stun a man. But in all cases the force of a shock depends upon the state of the organ, and if any electrical fish be stimulated to give a succession of shocks these will diminish in intensity till the organ becomes quite exhausted, and will not respond to the stimulus of the nerves. [GYMNOTUS, MALAPTERURUS, TORPEDO.]

Electricity (from the Greek *elektron*, amber, that material being the first employed to illustrate electrical effects). 1. When two dissimilar substances are separated that have been in close contact with each other, each is for a time in a peculiar condition. They are said to be electrified, and in this condition they possess properties that they do not possess ordinarily. Thus when a stick of sealing-wax is rubbed vigorously with a piece of cat's-fur or other similar substance, it is found to be capable of attracting small shreds of paper or other light material. Usually no similar property is noticed in the fur, the electrified state being more transient; but that such does exist in the fur also is shown by mounting it on a wooden disc with a glass handle, and holding the handle during the process of rubbing without touching the fur. The fur will then be seen to attract the shreds of paper in just the same way as the sealing-wax. If suitable precautions be taken, and if the observations be sufficiently close, the law will be found general that separation of different substances is attended with the peculiar state of things above mentioned. The magnitude of these effects does not represent the amount of rubbing of the two materials, but the intimacy of their contact. The electrified condition of the wax or fur may be shared with another body by putting either of them in contact with it. A small pith ball supported by a silk thread may be electrified by simply touching it with rubbed sealing-wax, or with the mounted disc of fur. This being the case it may be shown experimentally that the electrifications of the wax or of the fur are not identical; they may be regarded as opposite. If two pith balls be electrified by contact with the same sealing-wax, they will be found to repel each other when brought near together. If, however, the second be electrified by contact with fur, it will attract the first. These facts lead to the conclusion that the two bodies separated from each other become oppositely electrified, that similarly electrified bodies repel each other, and those dissimilarly electrified attract. The electrification of the sealing-wax is called *positive* (+), and that of the fur *negative* (−). All electrification is positive or negative, and its identity may be established by testing its attraction or repulsion of a known electrification.

It was stated that the electrified condition could be transferred from one body to another by contact. This transfer is known as *conduction*, and it is found that different substances possess in different degrees the power of conduction. All may be classified as conductors or non-conductors, though there is no sharp line separating the two sets. A very bad conductor is called an *insulator* or *dielectric*. It is because sealing-wax is an insulator that its electrification persists for some time, and conversely it is because the fur is a fairly good conductor that the electrification is rapidly conducted away, unless an insulating handle of glass be employed to keep the fur electrified.

If an insulated electrified conductor be brought near a conductor that is not electrified, the latter will be found to have an electrification induced in it without contact with the first. On the side of the second body nearest the first an opposite electrification manifests itself, and on the side more remote an electrification exists like that which exists on the first. If the second body be touched with the finger, the like electrification disappears, being neutralised by conduction, and there remains on the body a balance of electrification opposite in kind to that of the first. This process of electrifying is called *induction*.

It is convenient in many ways to regard an electrified body as being possessed of something more or less than it possessed before; that electrification means an introduction or withdrawal of this new substance, or a splitting of it up into constituents, which together neutralise each other and are unobserved, but which, separate, exhibit opposite properties. This hypothetical substance is called *electricity;* the two above assumptions are known as the one-fluid and the two-fluid theories respectively. It has not been proved that any such substance exists; experiment readily demonstrates the electrified condition, but does not show whether it is due to a new substance, or to a special state of the particles of the body and of the ether pervading it, or to a modification of the ether which might act as a new substance. In any case, it is unsatisfactory to speak of electricity as having a definite existence. Whereas many analogies exist between electrical actions and the actions of a fluid, by which several of the important truths concerning the former may be more readily grasped, these analogies cannot be carried beyond a certain point without causing gross misconception. Several of the old terms employed in this subject are still used, but with slightly different definitions.

Quantity of electricity, for example, must now be understood as the amount of positive or negative electrification that is able to exhibit electric effects. This may also be called a *charge* of electricity.

With this notion of electric quantity, certain quantitative laws may be introduced. The addition of two equal electrifications gives double that of either, so that if a convenient unit be chosen, electric quantities may be expressed numerically and may be added together. The law already stated, that two bodies similarly electrified repel each other, does not state the intensity of the repulsive force. By an instrument known as Coulomb's torsion balance it was found that two quantities of electrification q_1 and q_2, in two small bottles whose distance apart was d, caused a force proportional to $q_1 q_2 \div d^2$, repulsive when q_1 and q_2 were like, attractive when they were unlike. Thus if either quantity were doubled the force would be doubled; if their distance apart were doubled, the force would be only one quarter of its original value. This law resembles that of magnetic and that of gravitational attraction. By means of it, instruments may be made to measure intensity of electrification by measuring forces, or to compare quantities by comparing the forces that they exert on the same quantity placed at the same distance from each. All such instruments are known as *electrometers;* the best known of these is the Thomson Quadrant Electrometer. Those instruments that only exhibit electrification effects are called *electroscopes*, of which the most familiar is the gold-leaf electroscope. This consists of two equal rectangular strips of gold-leaf hanging side by side within a glass bottle. They are kept close together at the top, but are free to separate and open out at their lower ends; they are best supported from an insulating bridge of glass rod, and from them passes a metal wire upwards through a small hole in the stopper of the bottle. The bottle should be coated with strips of tinfoil all connected together and to the wooden base of the instrument. The wire is terminated outside the bottle by a knob of brass or other conducting substance. When electrification is given to the knob by contact, conduction gives a portion of the charge to each of the gold leaves, which are therefore possessed of like electrifications and repel each other. That they should do so is seen also in another way; an induced charge of opposite kind is produced on the inner surface of the tinfoil coating, and the gold leaves are attracted towards the sides of the vessel by an electrification opposite to their own. The distance apart of the leaves is a rough measure of the intensity of electrification.

That the force of attraction is inversely as the square of the distance is proved by experiment and mathematics in a much more refined way. It is found that a charged hollow sphere exerts no force at any point within itself; this is proved mathematically to be possible only when the law of force is as stated above. It becomes, therefore, impossible to charge a body by placing it inside an electrified conductor; and it also follows that the electrification of a conductor must tend to be confined to the outside surface.

The unit amount of electrification is such that it exerts a repulsive force of one *dyne* (q.v.) on the same amount placed at one centimetre distance. Such is the electrostatic unit; other more convenient units exist, the ratio between which must have definite physical meaning. [DIMENSIONS.]

If one positively charged body be brought near another, force must be exerted to overcome their repulsion of each other. Work must be done to produce this motion against resistance, and energy is therefore expended. The first body can recover its former position if constraint be removed, and in doing so it develops a certain amount of motion; the production of motion always signifies gain of kinetic energy, so that in its new position the body possesses an amount of energy of position that may be converted into kinetic energy if motion be permitted. This energy of position is called *potential.* The potential at any point is measured by the amount of work that must be expended on a body possessed with unit electrification, in bringing it from a region out of range of electric force up to the given point. Two points are at a different potential, when work must be done in bringing the body from one to the other; the body will perform the reverse route without a supply of energy, and give out energy in so doing. That point is at the higher potential, from which the body, if positively electrified, will pass when constraint is removed. If no difference of potential exists along a line joining two points, no force will be required to carry the electrified body from one to the other. To remove the constraint that prevents the passage of electrification from one point to another, a conductor may be made to connect them. Any difference of potential (D.P.) that may have existed will be removed, unless repeated supplies of electrification are presented at those points immediately after each neutralisation of potential. The action that goes on then in the conductor is called an electric current; and the analogy of a current of water may here be introduced. If two quantities of water at different pressures are connected by a conducting channel, the pressures at the two points will be quickly equalised, and the water "find its own level." But in the case of a river we know that two points a mile apart are not at the same level. Does not the water follow the same law? The answer is simply that the water is continually flowing in order to equalise the level at the two points, but that a fresh supply of water is being continually introduced at the higher level. If the supply were stopped, the level would be rapidly equalised.

All the points on the surface of a charged conductor are connected with each other by that conductor; hence, they are all at the same potential, even though the amount of electrification on one portion may be different to that on another equal portion elsewhere. Suppose then a spherical conductor be charged, and let its charge be uniformly distributed, as it will be if it is removed from the neighbourhood of other conductors. Points equally distant from the centre will obviously be at the same potential. These points lie on the surface of a sphere concentric with the conductor, and

determine what is called an equipotential surface, or surface of equal potential for all its points. No force is required to move an electrified body along such a surface. All such concentric spheres are equipotential surfaces, their potential becoming greater as the spheres are taken nearer the surface of the conductor itself. The introduction of any conductor to the neighbourhood must necessarily distort the equipotential surfaces, for the surface of the conductor itself is equipotential. Thus, in nearly all practical cases such surfaces are very complex. Nevertheless, they can never cut each other, for if they did their lines of intersection would belong to both and would be at two potentials at the same time, which is impossible.

The direction of motion of the small electrified body that is free to pass from one point to another at a different potential is along a definite line. This line shows the direction of the force at every point along the route, and is called a *line of force*. In the case of the charged sphere the lines of force are all radial, passing at right angles through each equipotential surface. They are always at right angles, however irregular the surfaces may be. The lines of force in electricity are identical in theory with those in magnetism or in gravitation, and need not be described in detail here. [Dynamo-Electric Machinery.]

If an insulated plate be positively electrified and brought near an uninsulated plate, an induced negative charge will appear on the latter, and will remain until the positive charge be removed. Though the induced electrification may not be always observable, it is shown that any charge will induce an equal but opposite charge on its surrounding conductors, however remote they may be. Thus, if the tinfoil coating of the gold-leaf electroscope be removed, the charge on the leaves and the metal knob will induce an equal and opposite charge distributed over the walls of the room in which the instrument is placed. When the electroscope is discharged, the induced electrification also disappears. The arrangement of two conductors separated by a dielectric is called a *condenser*; thus, the electroscope and the walls of the room, separated by air, form a condenser. The second conductor is invariably uninsulated. The nearer they are together the less their difference of potential, for their tendency is to unite, and it has been shown that to help this tendency is to help an equalisation of potential. But increasing the charge on the one, and thereby increasing the induced charge on the other, raises their difference of potential. The *capacity* of the condenser is measured by the amount of electrification necessary before the two are at unit difference of potential. It depends on the size of the conductors, on their shape and distance apart, and on the separating dielectric. The best-known form of condenser is the Leyden jar (q.v.).

There are many machines that will produce electrification. The best known are the electrophorus, the Holtz, Voss, and Wimshurst machines. They all electrify by induction, and, excepting the first, they are arranged so that the induced charges shall be handed over to increase the inducing charges till by repeated accumulation the two conductors become so highly electrified that they cannot retain their charges. These either neutralise each other by breaking across the dielectric separating the conductors, or else discharge themselves into the particles of air surrounding them.

It has been stated that two dissimilar substances on separation from contact become oppositely electrified. The work done in separating them is a measure of their difference of potential when separated. It would, therefore, seem as though when in contact they should be at the same potential. Volta found that dissimilar conductors in contact are always at different potentials, the magnitude of their difference depending on the nature of the substances and on their temperature and other physical conditions. The explanation of this is that they are never actually in contact, however closely they may be applied to each other. But suppose that the apposition is of a different nature. Suppose that any pair B and C are capable of combining chemically with each other. There is reason for regarding two substances chemically combined as being more nearly in actual contact than before; it is as though the P.D. between B and C has become much nearer zero.

If any two conductors B and C touch each other, which do not combine chemically, and are joined by a third, A, in contact with each, it might seem as if continuous electrification or current should pass along A, because it is a conductor connecting two regions at different potentials. But Volta found that the P.D.s at each surface of separation in any such circuit were so arranged that no P.D. exists at the two ends of the same conductor; *i.e.* the sum of the P.D.s from A to B, B to C, and C to A is zero, and no current can flow along A or B or C. In some respects this law may be viewed as a correlative or as an extension of Newton's Third Law of Motion. [Dynamics.] But in the event of, say, B and C exhibiting a tendency to combine chemically with each other, the P.D. from B to C becomes zero, and the above law of Volta no longer holds. A potential difference exists in the circuit, and a current flows, representing just so much energy as is set free by the combination of B and C. As to the questions whence comes the current and in what direction does it flow, no satisfactory answers can be given; but it must be repeated that there is no present knowledge of the existence of such a *thing* as electricity, nor, therefore, of any flow. With the water analogy in mind, it may, perhaps, be useful to point out that, whereas the analogy holds when the energy relations are most simply discussed, there seems reason for believing that if flow occurs at all it occurs in both directions at once—a state of things that demands a rather complex water-analogy. In the case of water the energy given out per second is measured by the amount of water displaced per second multiplied by its loss in level. So also in the electrical case, the energy per second is measured by the amount of electrical displacement per second multiplied by the potential difference.

When A is an insulator of considerable thickness the continuous neutralisation of electrification is

rendered impossible, and we have no current flowing. In that case the difference of potential at those points on B and C touched by A will show the available D.P. that tends to produce current in circuit. But A may not be a perfect insulator, and yet offer obstruction to the above action. This is called *resistance* (q.v.) and depends on the material of which A is made. The obstruction is not complete, so that some current will flow. If no resistances were in circuit, the amount of electrification due to the given D.P. would be unlimited; the current would be infinite. But with resistance in circuit, the current is finite, diminishing as the resistances are increased. Work must be done to effect the passage of electrification against that resistance, and the energy requisite is supplied by the chemical action that takes place between B and C; this energy so spent is converted into heat, and the circuit gets warmer. Such an arrangement for supplying energy is called a *battery* (q.v.); a single centre of supply is called a *cell*. It supplies energy at a certain difference of potential depending on the substances that interact; since this D.P. is to send a current through the circuit it is called *electromotive force* or E.M.F., but the term has objections. To take a simple concrete case, A may be a piece of copper wire one end of which is attached to a copper plate, the other end to a zinc rod C, the plate and rod dipping into a dilute solution of sulphuric acid B. Thus the three substances, A, B, and C, are copper, dilute sulphuric acid, and zinc. The last two are capable of combining, and in so doing give out a certain amount of energy at a certain D.P.; this displays itself, in the first instance, in producing an electric current in the circuit; mechanical motion of neighbouring bodies may be induced by the current, but sooner or later the whole fritters down to heat unless special provision be taken to store some of the energy of the electric current in an accumulator.

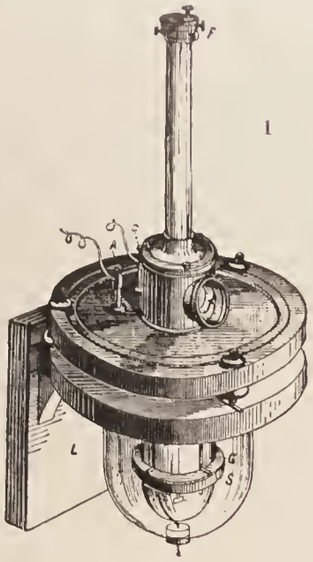
It is found that lines of force exist in the neighbourhood of an electric current. In the case of a straight wire, for example, the lines are concentric circles at right angles to the axis of the wire. These are lines of magnetic force; any magnet brought near will tend to range its axis along the line of force through its point of suspension. The intensity of the acting force is proportional to the strength of the current and to the length of the wire, to the strength of the magnet-pole and to the inverse square of its distance from the wire. Thus to produce the greatest effective force on the magnet, the wire should be in a coil of great length close to the magnet, and the current should be as large as possible. This magnetic action of a current is the principle of most of the ordinary current-measuring instruments. They are known as *galvanometers*, the ordinary type consisting essentially of a coil or coils of wire arranged in close juxtaposition with a magnetic needle pivoted on a point or supported by a fibre. The needle is acted on by a controlling couple of forces that tend to keep it in the magnetic meridian, and by a deflecting couple due to the current in the neighbouring coils. The resultant of these two couples is that the needle is deflected, the magnitude of the deflection being to some scale representative of the intensity of the current. The unit of current practically adopted is the *ampère*, variously defined unfortunately, but theoretically based on the electro-dynamic principle previously stated. Certain instruments are so graduated as to give the magnitude of the current direct in ampères; such are termed *ammeters*. The method of accurately graduating such an instrument will be referred to when electrolysis is discussed.

The only electrical unit at present legalised is the unit of resistance. This is the *legal ohm*, and is defined as the resistance offered by 106 centimetres' length of pure mercury at 0° C., its cross-section being 1 square millimetre. But in much the same way as the standard legal metre, the French standard of length, does not coincide with the ten-millionth part of the earth's quadrant by reason of inaccuracy of measurement, although such was the original definition of the same; so the legalised ohm by reason of inaccuracy of measurement does not exactly coincide with the unit that theory defines as the best. Not that scientists have obtained an exact measure of the true unit, any more than surveyors have exactly measured the earth's quadrant, but they have proved the legal ohm to be perceptibly inaccurate.

The ordinary unit of difference of potential, necessarily associated with the unit of work [ERG], is the *volt*. It is such as will, if maintained at two points joined by a conductor of one ohm resistance, send a current of one ampère through that conductor.

An important theorem known as *Ohm's Law* should now be explained. If a constant P.D. of magnitude v be maintained at the extremities of a conductor whose resistance is r, so that a current c flows through it, then it is found by experiment that doubling the resistance halves the current, but that doubling the electromotive force doubles also the current. Or, more generally, the current is proportional to the P.D. and inversely proportional to the resistance. If convenient units be chosen, the law may be expressed in the simple mathematical form $c = v \div r$. The above definition of the volt is so chosen that the ampère, volt, and ohm are thus simply related to each other.

It was explained previously that the power spent in a circuit was measured by the product of current and potential difference. One ampère through one volt P.D. requires a unit of power, termed a *watt*, 746 of which go to the horse-power. This represents the power expended in overcoming the resistance r—the rate at which energy is lost in electric friction. It has its equivalent in heat units; if the number of watts be multiplied by ·24, the product gives the amount of heat in calories generated per second. The above shows how energy of electric current may be changed into heat-energy. The reverse process may also be effected directly, this part of the subject being termed *thermo-electricity*. It was explained how a D.P. existed at the surface of contact of any two substances A and B, and it was mentioned also that the D.P. depended, among other things, on the



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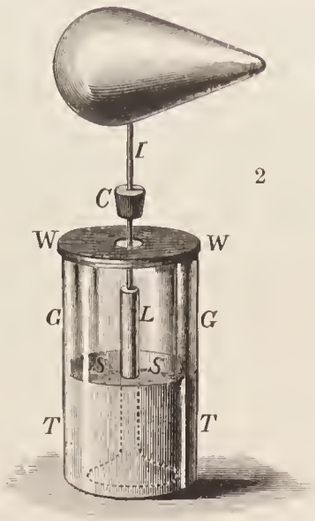

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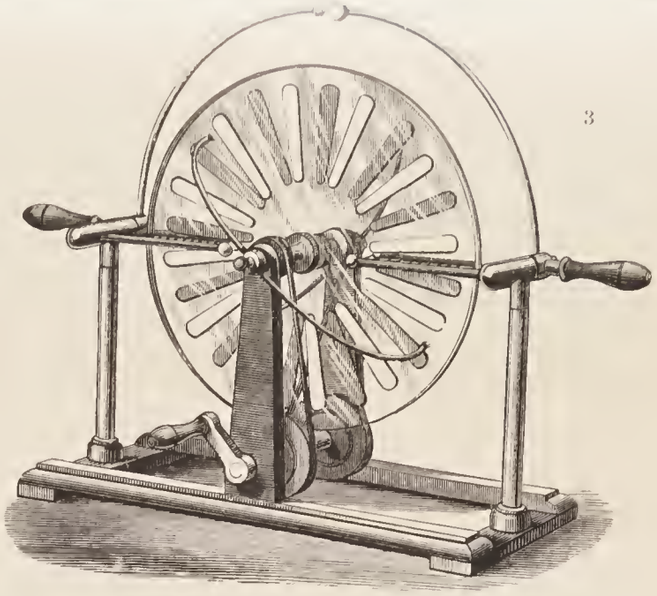

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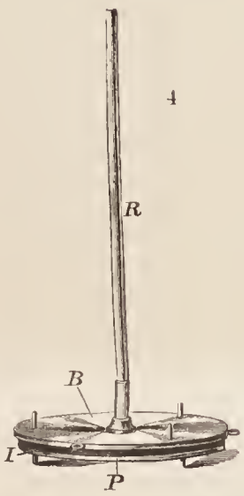

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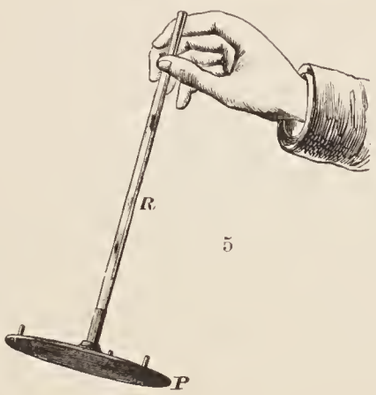

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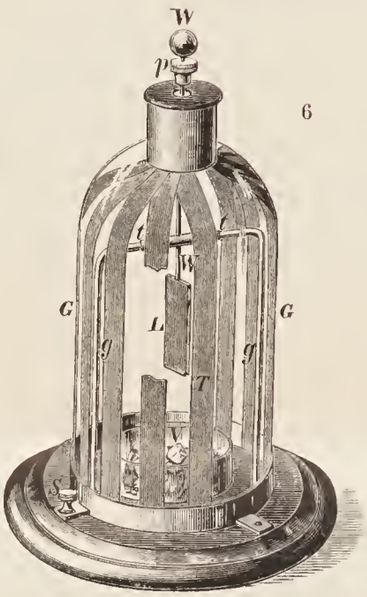

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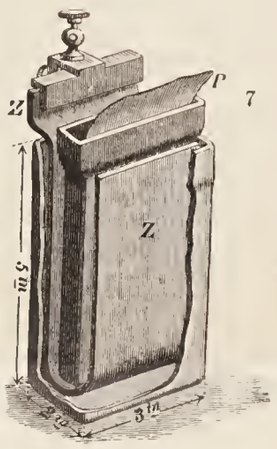

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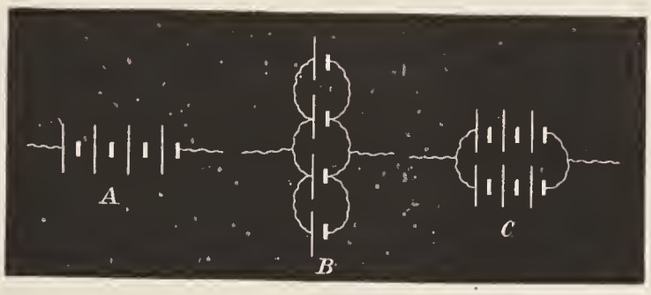

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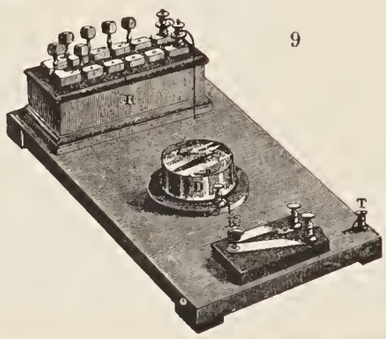

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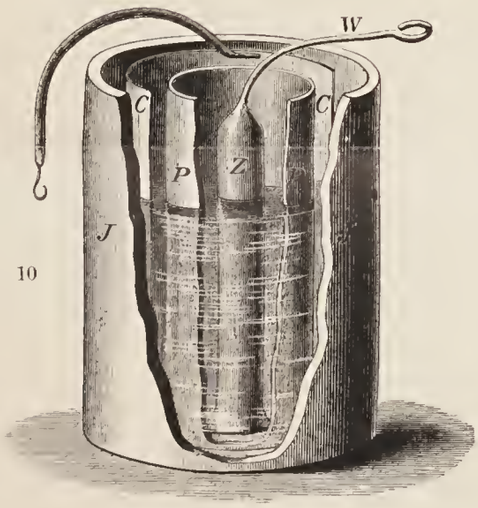

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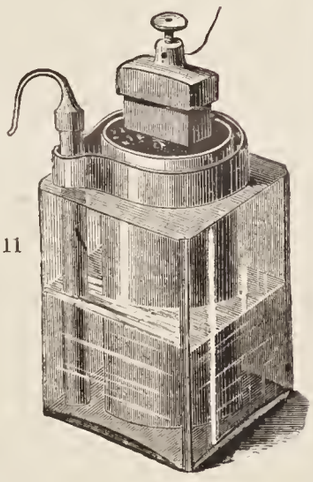

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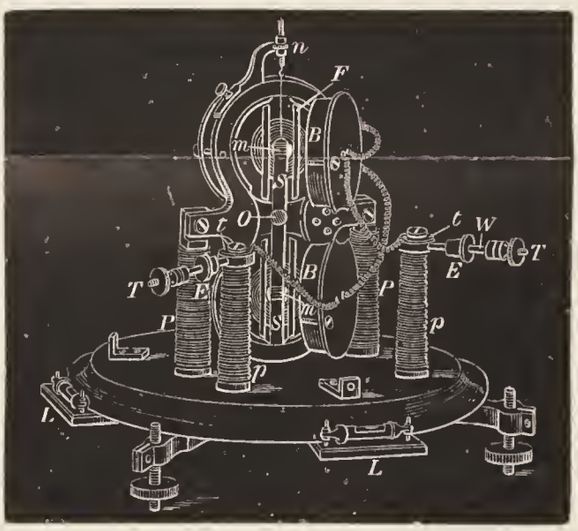


12

ELECTRICITY.

1. Edelmann's Quarter-Cylinder Electrometer.—L, Metallic bracket holding the instrument; G G, quarter-cylinders of brass, held in position by ebonite collars, S; A and B, electrodes connected with opposite pairs of quadrants; F, suspension of silk fibre supporting the needle; *f*, window by means of which deflection may be measured from outside.
2. Leyden Jar.—T T, Tinfoil; S S, sulphuric acid; L, leaden rod, with upper part I, of iron; W, wooden cover, closed up by the cork C, to keep out the dust when not in use.
3. Wimshurst Influence Machine.
4 and 5.—Electrophorus.—I, Ebonite plate; B and P, upper and lower plates of brass; R, insulating handle for upper plate.
6. Gold-leaf Electroscope.—G G, Glass shade; L, gold leaves supported by wire W; *g g*, glass supports for W; V, vessel containing sulphuric acid; *p*, small plug to be pressed down when instrument is not in use.
7. Grove's Cell.—Z, Zinc plate in dilute sulphuric acid; P, platinum plate in strong nitric acid.
8. Diagram showing: A, four cells in series; B, four cells in parallel; and C, three in series with two in parallel.
9. Apparatus for Calibrating Galvanometer.—R, Resistance box; D, galvanometer; K, key.
10. Daniell's Cell.—Z, Zinc rod in porous pot P containing dilute sulphuric acid; C, copper plate in outer vessel containing copper sulphate solution
11. Leclanché Cell.—Zinc in sal-ammoniac solution; carbon slab in charcoal and manganese dioxide.
12. High-resistance Galvanometer for very small currents. [Galvanometer.] It is a mirror galvanometer, with an astatic needle.

temperature of the two. Thus, between A and B when cold there is not the same D.P. as between them when hot, one or other supplying a greater difference of potential. Suppose, then, a bar of bismuth be joined at one extremity to one end of a bar of antimony and to the other end at the other extremity, so that they form a circuit, part of which is bismuth and part antimony. When the junctions are both at the same temperature there will be no D.P. available to send a current round the circuit; there will be no more reason for its flowing one way round than the other. But if the one junction be heated to a higher temperature than the other, the D.P.s at the junctions no longer balance; one will prevail over the other, and a current will flow from the bismuth to the antimony at the hotter junction and from antimony to bismuth at the colder. These two substances are specially chosen because they give a greater D.P. per degree rise in temperature than any other pair of simple substances. A pair of such junctions thus acts like a battery in supplying an electromotive force; the E.M.F. is proportionately greater if a number of pairs be taken. It increases if the temperature of the hotter junctions be increased, but a critical point is at last reached beyond which further heating diminishes the E.M.F. If instead of heating one set of junctions in the thermo-electric circuit a current be passed round, reverse heating effects will be produced, viz. that junction, which was the hotter when a current in the same direction was formerly produced, will now become colder, and the other hotter. This is necessary from the principle of conservation of energy.

Another case of reversal introduces the subject of *electrolysis*. The chemical combination of substances possessing some affinity for each other supplies energy that will produce an electric current. Conversely the energy of an electric current may in special cases separate certain of the ingredients in a chemical compound. Certain compounds conduct electricity in much the same way as elements; others can only do so at the expense of their own constitution, they being split up in the process. Such are termed *electrolytes*, and it is with those that this branch of the subject deals. If two platinum plates dip into a beaker containing dilute sulphuric acid, a sufficient difference of potential applied at their terminals will send a current through the cell. Then bubbles of hydrogen will begin to congregate on one plate and oxygen on the other. It is conventional to call the direction of the current that from the oxygen plate to the hydrogen plate within the cell. So hydrogen is deposited on the plate where the current leaves the cell: this plate is called the *kathode*. Oxygen is deposited on the plate where the current enters the cell; that plate is called the *anode;* collectively, the plates are termed *electrodes*. Gases or other materials so produced are termed *ions;* those deposited like hydrogen on the kathode are called *kathions*, those on the anode *anions*. The quantity of each of the above gases produced by this electrolysis shows that water is decomposed into these constituents. Two volumes of hydrogen come off for every volume of oxygen at the same temperature and pressure. Inasmuch as these two gases unite with explosive force and give out heat in so doing, it is evident that work must be done to separate them. Insufficient P.D. will not effect this; a single Daniell's cell, for example, cannot be employed for that purpose. If the gases so obtained be collected over each electrode, it will be found, if the original battery be removed and a conductor put in its place, that the electrolytic cell itself behaves as a battery, giving a current in the reverse direction. The hydrogen and oxygen gradually recombine again, and the current continues till the gases are all used up. Thus, the cell has been acting as an accumulator of electric energy. This arrangement is known as Grove's Gas Battery, and embodies the principle of the modern secondary battery or accumulator. [Battery.]

Another class of electrolytic cells exists, of much importance in electroplating and allied processes. If the electrodes are of copper and the electrolyte a solution of a copper salt, such as copper sulphate, then the passage of an electric current will still cause decomposition of the electrolyte. But the ultimate action is that the anode is continually deprived of particles of copper, and as continually the kathode has copper deposited on it. The latter need not necessarily be of copper; if it is a conductor, it will receive a coating of the metal in solution. For this action the smallest P.D. will suffice, for there is no ultimate tearing asunder of different materials chemically combined. The amount of copper deposited per second is ·000325 gramme per ampère, and a corresponding number exists for silver from a silver salt, hydrogen from a hydrogen salt, or any other metal that may be deposited. Such data are of much importance in measuring current accurately; the current may be made to deposit silver or copper electrically; the amount of deposition in a given time is estimated, and the current calculated therefrom.

The more important electrical terms are noted separately, as also are the practical applications of electricity. (*See* also the plate facing page 321.)

2. *Medical.* By the employment of electrical apparatus the physician is able, in the first place, to learn important facts about the condition of the muscles and nerves in certain forms of disease; and, secondly, he is able to mitigate the ill-effects of the mischief which exists and in some instances to cure the disease outright. Since the first introduction of electrical methods into medical treatment much has been learnt, and both in diagnosis and as a therapeutic agent the electric current is of great service. The exaggerated claims which have been set up with regard to this form of treatment have, however, done much to discredit the application of electricity. This is unfortunate, for there are certain forms of disease in which it is of undoubted benefit. At the same time, there can be no doubt that many persons waste time and money in seeking the alleviation of troubles by the employment of means in no way adapted to the end which it is proposed to gain. Two forms of electricity are employed in medicine. Galvanic electricity (the constant current) and Faradic

electricity (the induced current). Static or frictional electricity, too, is sometimes employed, but is of very limited application.

To deal first with electricity as a means of diagnosis. It has been found that, when a nerve is diseased, its irritability when tested by electric currents undergoes certain alterations. By applying the electrodes to the skin over the nerve and noting the reaction of the muscles which the nerve supplies, important facts can be made out. If the nerve is healthy, the muscles readily contract on applying a faradic current; and when the constant current is used, it is found that the contraction is more energetic when the electrodes are applied so that the current passes down the nerve than when it passes up it. If the nerve be diseased, the contraction occurs less readily with both the faradic and constant currents, but faradic irritability diminishes much more rapidly than does the response to the constant current. Again it is found that, when the constant current is employed, if the electrodes be arranged so that the current passes up the nerve, the muscles contract more readily than they do when the current descends and passes down the nerve. These altered phenomena in the contraction of muscles supplied by the diseased nerve are spoken of as the "reaction of degeneration." The importance of these facts is great. In cases of doubt it is possible, by studying the reactions of the muscles to one or the other form of stimulus, to make out whether disease is situated in the nerves or in the muscles.

The employment of electricity as a curative agent opens up a very large field for discussion. In the first place, electric currents are employed to stimulate nerves and muscles. To take, for example, the case of Bell's palsy or paralysis of the muscles of the face due to disease of the facial nerve. Here much good can be brought about by the systematic application of faradism or galvanism, the palsied muscles being stimulated and caused to contract, and so prevented from wasting from mere disuse; while the effect of the currents on the nerve itself is likewise attended with benefit. Speaking generally, faradic currents are employed where the irritability to the induced current is not completely lost, while galvanism is indicated when there is no response to the faradic current. In the second place, electricity may be employed to relieve pain, as in neuralgia, sciatica, and the like. In all instances the strength of current employed needs to be carefully determined. If the object be to produce muscular contraction, the weakest current which will produce that result is usually applied; if it be desired to relieve pain, such a strength of current as is conveniently borne by the patient is, as a rule, quite sufficient, and no greater strength of current should be employed. Other uses of electricity are in the treatment of nævi and the like, where the cauterising action of a strong current is made use of; as a counter-irritant; and in certain hysterical affections.

Electric Light at present signifies the production of illumination by heating certain convenient materials to incandescence, an electric current being employed to effect this heating. When a current passes through a given resistance, heat is generated in quantity proportional to the resistance and to the square of the current. This tends to raise the temperature of the substance at a rate dependent on its specific heat, its emissivity or power of radiation from its surface, its general dimensions, and the external temperature. But if it be a thin rod offering considerable resistance, currents may be sent through it that will, in course of time, so raise its temperature that it becomes incandescent. Of such a nature is the *incandescent lamp*, which consists of a filament of specially prepared carbon or carbonised material coiled in a glass vessel, from which the air has been extracted by a very efficient air-pump. Each end of the carbon is joined to a platinum terminal passing through the glass to the outside. The two terminals are connected up with the leads or wires supplying the current. If the air were allowed to remain in contact with the filament when hot, it would supply oxygen that would immediately combine with the carbon, and the whole filament would be quickly burnt. Platinum terminals are used because that metal has almost exactly the same coefficient of expansion as glass when heated, and will, therefore, expand with the glass without cracking it or becoming loose. In course of about 1,500 hours even a carefully made and steadily worked lamp will burst its filament, and a fresh lamp must then replace it. The life of a lamp is prolonged if a low E.M.F. be used with it; but then the light is less brilliant and more yellow, and its efficiency reckoned in the number of candles per watt or horse-power is not so high. On the other hand, a whiter, more brilliant, and more efficient light can be obtained by using a higher E.M.F., but then its life is shorter. The other type of electric light is that known as the *arc-lamp*. In this case two carbon rods are first brought together, and a current started through them. The resistance at their point of contact is considerable, and they are rapidly brought in that region to a state of incandescence. Moreover, a small quantity of carbon is volatilised, and remains as hot carbon vapour. The rods are then drawn a short distance apart. The current is enabled to flow across because of the carbon-vapour, which, though of high resistance, conducts sufficiently well to prevent a complete falling-off of the current. But its great resistance renders the temperature exceedingly high, and by this means the solid carbon is kept at white heat. The vapour is at a much higher temperature than the solid, but exact estimation of either temperature has not yet been made. The arc light is not kept out of contact with air, and the carbons slowly burn away; various devices have been introduced for automatic regulation of their distance apart.

Both arc and incandescent lamps, since they depend on the production of heat by current flowing against resistance, may be worked by direct or alternating currents. The current may be supplied direct from a dynamo (q.v.), indirectly with a transformer (q.v.), or from accumulators. The object of the transformer is to bring the current

to a suitable condition of strength and potential for the lamps used. Accumulators may be charged by dynamos and then taken off to be worked till they run down again.

There are two general methods of arranging lamps, in *series* and in *parallel*. Lamps in series form a continuous chain, the negative pole of one joining on to the positive pole of the next, and so on. Thus the same current passes through the set; and if by chance one lamp happened to fail, the current would be stopped for the set.

Lamps in parallel are arranged so that all the positive poles are connected up with one bar, and all the negative poles with another bar. These two bars are kept at a constant D.P., which therefore exists for each lamp, and so keeps an equal current going through each. If one lamp fails the others still go on. The greater the number in parallel the less the resistance of the set, so that the total current is actually increased by increasing the number of lamps. But then more power is required for the circuit, and a greater proportion of the whole E.M.F. available goes to overcome the resistance of the generator.

Arc lamps in one system are usually put in series, any danger of the whole set going out when one fails being removed by an automatic device for short-circuiting each lamp if its current fails. This means that when the self-regulating mechanism does not act, the current is allowed to flow from one terminal of the lamp to the other by a different path.

Incandescent lamps are generally in parallel sets, each set being worked from the generator by independent lines, or lines in parallel or in series.

But the different methods of arrangement are too numerous to describe in detail. Various installations of different types are continually being laid, the arrangements depending on the amount of lighting to be effected, on the general position of each centre of lighting, and also on the method employed to generate the currents. The largest installation in the world is that of the Electric Supply Corporation, which has its central station at Deptford. The proposed plan is to supply London with alternating-current electricity at a potential of 10,000 volts, to be reduced by transformers to 100 volts. Signor Ferranti, the engineer, has worked wonders in carrying out his designs without any helping precedent. Nevertheless, an unfortunate series of accidents has brought the scheme to the verge of failure, and it is yet uncertain how matters will terminate.

The theoretical defect in these modern systems of electric lighting, or indeed of any artificial lighting, is that so much power is wasted in the production of a large proportion of dark radiation. An arc lamp certainly gives out waves of such frequencies as will produce the sensation of light; but it also gives out an immense amount of dark heat waves, which are practically useless from the light-giving point of view. The light from a glow-worm is far more efficient than that from an arc lamp, measuring efficiency as the ratio of the energy of light-giving waves to the total energy supplied. What is required, then, is to give to a material just those vibrations that will cause it to incandesce, and no more; the possibility of so doing has been recently pointed out by J. J. Thomson, Crookes, and Hertz, who have separately worked at electro-magnetic radiation. [LIGHT.]

Electric Railway is such that trains thereon are supplied with electric current as motive power. Since 1879, when Werner Siemens opened an exhibition line at Berlin, on which a train of three carriages carrying twenty people was driven by a stationary dynamo at a speed of seven miles an hour, the subject has received much attention at the hands of electrical engineers, and various plans have been devised and tested practically. The train carries some form of electric motor, which will produce mechanical motion if a proper electric current at a suitable potential be supplied. [DYNAMO.] There are two ways of so supplying the current; the one from a fixed dynamo or generator to the train by means of conductors, the other by means of charged accumulators carried on the train, which supply electricity for a definite length of time till their charge is exhausted. In the conductor system there must be some arrangement by which two terminals of the motor are kept at a constant D.P. The plan of supplying the rails on which the train runs with electricity at different potentials is not entirely practicable, because of the difficulty of insulating them from the ground. A single raised conductor has been employed successfully, kept at the required potential and supplying this to the moving motor by means of a sliding or rolling contact; the other terminal of the motor is kept at zero potential by contact with the rails. The parallel system is adopted when several cars are to run on the railway at the same time. It means the working of the motor by means of two conductors at different potentials, which are joined across by the motor wherever it may be placed. One of the conductors may be at zero potential. The series system is to use only one conductor, which is divided up into short segments insulated from each other. The terminals of the motor are connected by sliding or rolling contact with points on the conductor sufficiently far apart to stretch from one segment to another. The different segments being kept at different potentials, a D.P. must exist between the terminals of the motor, which may therefore be driven if the D.P. is sufficient. The advantage of this plan is, that while the motor is on one section it may be made to cut off the supply from the one behind, and so prevent too close an approach of another train. A special application of this series system is that of *telpherage* (q.v.), introduced by Fleeming Jenkin. In the Glynde telpher-line the conductor is supported in the air, and from it the train hangs. The carriages are small buckets, and are employed for carrying clay. The storage system has many advantages over the other. Much less difficulty presents itself in planning the installation; there is no laying down of conductors along the route, and each train is complete in itself. On the other hand, efficient accumulators are large and heavy, they are subject to damage by jerking, etc., their

dead weight has always to be carried, and there is the trouble of periodically charging them; but the system is adopted in many long-line cases with advantage, though in short lines the conductor system has the preference.

Electric Telegraph. [TELEGRAPHY.]

Electric Welding, a process of welding by aid of an electric current that heats to welding-point the two surfaces that are to be united. Suppose two wrought-iron bars are to be welded end to end, they are each gripped close to the portion that requires heating, and a very large current passed from one grip to the other along the intervening portions of the two wrought-iron bars. These are pressed closely together, but offer such resistance at their imperfect junction that they are rapidly rendered white-hot, and reach that special condition of fluidity that enables them to unite into one piece. At the junction they will bulge out when first united, and require subsequent hammering down. Alternating currents that have been transformed from fairly high potential to perhaps 10,000 ampères at low potential, are preferably employed, as they can be readily produced by a transformer and need not introduce much resistance into their circuits, except where the weld has to be performed. [TRANSFORMER, WELDING.]

Electrification, the production of one of the two opposite conditions of a body that by comparison with the condition of rubbed amber (Gk. *ēlektron*) are termed electrified. Electrification may be positive or negative, or, as was once the method of expressing them, vitreous or resinous: glass and resin being the favourite materials experimented upon by old philosophers to examine the opposite electrifications. [ELECTRICITY.]

Electro-magnetism. [MAGNETISM.]

Electro-metallurgy is an important art based on electrolysis. A layer of metal may be deposited on a plate of any shape if this plate be in a suitable solution of the metallic salt, and if a current be passed from a rod or slab of the metal through the liquid to the plate. If the layer is to remain permanently, the process is termed *electroplating;* if it is to be taken off, retaining, of course, any impression that is made on its inner surface by any pattern previously cut on the plate, the process is termed *electrotyping*. The process of electroplating strictly applies to the deposition of silver only, but gold, platinum, copper, and other metals may also be deposited. Silver will not adhere to all metals; iron, for instance, in order to be plated, must first be coated with copper, and this with silver. The surfaces to be coated require first very careful cleansing in boiling caustic potash and then in dilute nitric acid; they are then scoured with sand. The solution of silver generally used is made up of one part of silver cyanide with 10 of potassium cyanide and 100 of water. This is contained in an earthenware trough in which hang the articles to be plated, all connected by a wire with the negative or zinc pole of the battery or dynamo employed. The positive pole is connected with a silver plate immersed in the solution, and the current in flowing through the cell removes silver from the plate and deposits a layer on the given articles. The success of the plating depends largely on the strength of current and of the solution, and on the shape and size of the electrode. When the silver is of sufficient thickness, the articles are taken out of the plating-bath; they are polished with a rotating wire brush, and then a finish is given by burnishing. Electrotyping is of great importance in many directions, for by means of it copies of woodcuts, printing type, engraved plates, medals, etc., may be taken in metal and rendered practically permanent. There are two methods available to obtain copies of, say, a woodcut. Either an impression may be taken in wax, guttapercha, or some other soft substance that will retain a clear impression; this is then made electrically conducting by being brushed over with plumbago, and hung in the plating-bath as in the electroplating process. Or the original woodcut may be itself hung in the bath, and a layer of copper deposited over it. In the former case an exact copy is at once obtained, in the latter a reversal is first produced, which may easily be removed from the woodcut and then itself used to receive a fresh layer of copper. This will be an exact copy of the woodcut.

Electromotive Force (E.M.F.) means the difference of condition that exists between two regions connected by a conductor, whereby a continuous neutralisation of electrification of opposite kinds is set up. The difference is one of potential between the two regions, and is so measured. The term is ill-advised, but too general to be readily replaced by a better. [ELECTRICITY.]

Electrophorus, an induction machine, composed of an ebonite or resin plate, upon which a circular disc of brass or other metal may be placed by means of a glass handle. When the non-conducting plate is rubbed with fur, it becomes negatively electrified, and this negative charge remains on the surface for some time. The metal plate is then placed on it, and touched with the finger. Being in close contact with a negative charge, which cannot, however, be conducted away because of the insulation, an opposite charge is induced on the plate, the remaining negative charge on the outside being conducted away when the finger touches it. Then, when the plate is entirely removed, it will possess a residual positive charge that can be demonstrated by the small spark that escapes when the finger is again brought to it. The process may be repeated many times without apparent loss of the initial negative charge on the insulator. This is because the charge that manifests itself on the plate is not derived from the insulator at all, but practically from the earth, to which it returns when the sparking takes place. There are various modifications of the instrument, designed to illustrate the laws of induction more clearly.

Electrum, a native alloy of gold and silver containing upwards of one-fifth silver. It is so named by Pliny. It occurs in Sutherland with 21 per cent. silver; but more usually, as in

Transylvania, the Altai and Colombia, with 36 to 38 per cent. Its colour ranges from brass-yellow to yellowish-white, and its specific gravity varies regularly with the silver percentage from 15·5 to 12·5. It crystallises in the cubic system, in forms often more sharply defined than those of native gold.

Elegit, the name of the writ by which, after judgment in an action has been obtained, the sheriff gives the judgment creditor possession of the lands and tenements of the opposite party to be occupied and enjoyed until the money due on such judgment debt is fully paid, and during the time the judgment creditor so holds them he is called tenant by *Elegit*, his estate being a mere conditional one defeasible as soon as the judgment debt is levied. By this writ formerly only one-half of the lands and tenements of judgment debtor could be taken in execution, but a statute passed very early in the present reign for the first time enabled the judgment creditor to seize by that writ the whole of the judgment debtor's lands and tenements.

Elegy (perhaps from Greek *e-e-legein*, to cry Woe! woe!) originally implied a mournful poem; and then was used to signify a certain poetical measure consisting of couplets of alternate hexameters and pentameters, commonly known as elegiac. Coleridge gives an example of it thus:—

"In the hexameter rises the fountain's silvery column;
In the pentameter aye falling in melody back."

It is possible that the connection between elegy and the idea of mournfulness arises from the fact that this metre was a favourite one for funeral inscriptions; but it was used also for joyous poems and for war songs. Everyone knows Gray's Elegy, and readers of Hood's comic poems will remember his line—

"And I've been singing his L-E-G."

Element. According to the doctrines of Empedocles and Aristotle there were four elements, earth, air, water, and fire, to which was also subsequently added a fifth, the *quinta essentia*, the ether. It seems probable, however, that these ideas did not originate with the Greek philosophers, but were borrowed from earlier sources, perhaps from the Indians. The term element as used by them, however, did not convey the same meaning as it does at the present time. It then implied a property or complexion, rather than a form, of matter. Thus the properties of cold and moisture were associated with water, cold and dryness with earth, etc. Later, the alchemist Geber supposed all metals consisted of varying quantities of *mercury* and *sulphur*, and for the transmutation of metals what was necessary was but the addition or abstraction of one or other of these substances. Basil Valentine added *salt* as the third elementary substance, which, with the two previous ones, formed all bodies. It appears, however, that this sulphur, etc., were not identical with what we know now by the terms, and were possessed of many more or less mythical properties. Boyle first gave a distinct definition of the term element, stating that those substances are to be considered as elements which are not capable of further separation into simpler components. He did not, however, specify what substances he considered as elementary. At the present day about 70 simple bodies are recognised by chemists, a list of which is given under ATOMIC THEORY. Besides those there given, a few others may be regarded as doubtful, as, for instance, holmium, and masrium, whose existence was only indicated in 1892. Further, it is always possible that some of the substances regarded as elementary may be proved to consist of two or more simple bodies. Thus didymium is very probably not a true element, while the elementary nature of cobalt and nickel is also disputed. The first classification of the elements was that of metals and non-metals, and although it is impossible to draw a definite line of demarcation between these two classes the division is still a convenient one for many purposes. The sole basis, however, upon which a scientific classification can be founded is the Periodic Law (q.v.). Of the elements but few (about 20) are found free in nature, as oxygen, nitrogen, sulphur, carbon, and some metals, while most of these are far more common in combination. Compounds of carbon are known as organic matter. The crust of the earth consists almost entirely of 13 elements only, of which oxygen is the most abundant. What the composition of the interior may be, is, however, still a matter of conjecture. The question whether the various elements are distinct forms of matter or whether they are all various products of evolution from one primordial matter is one that affords great scope for theorising. Until recently the first view was that almost universally accepted, but of late years the second, an evolutionary idea, has been finding favour with many chemists. In the present state of knowledge, however, all theories upon this subject must be regarded as purely speculative. (*See* also ATOMIC THEORY, CHEMISTRY, PERIODIC LAW, and the articles on the separate elements.)

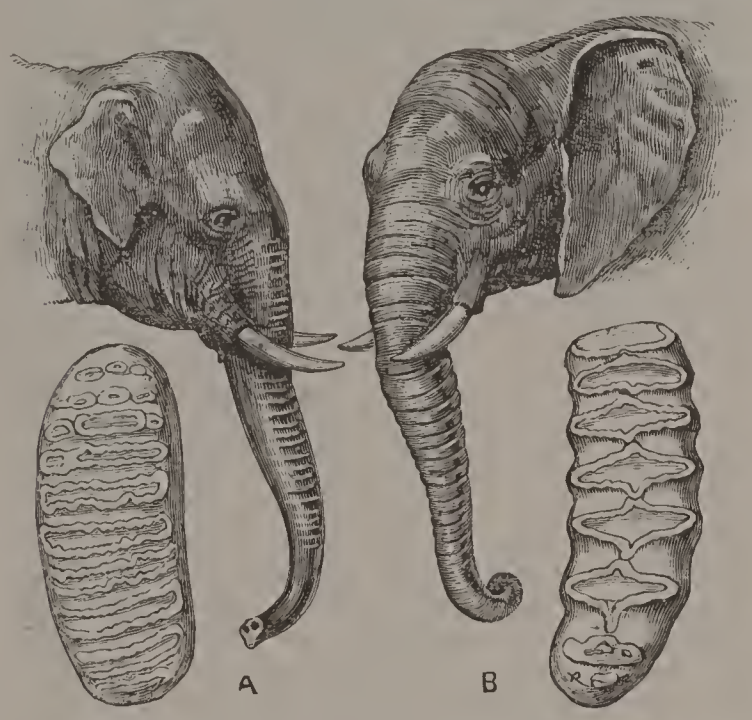
Elemental Spirits, a collective name for the beings formerly supposed to inhabit and rule over earth, air, fire, and water. [GNOME, SALAMANDER, SYLPH, UNDINE.]

Elements, in *Astronomy*, are the quantities from which the tables of planetary motions are calculated, such as the period of rotation of the planets about their own axes and their revolution round the sun, the dimensions of their orbits and the gradual movement of these, etc.

Elemi (from the Greek *ĕnaimŏn*, the name of a styptic gum said by Pliny to exude from the olive-tree of Arabia) is an oleo-resin, or rather a class of oleo-resins, partly crystalline and less soluble in alcohol, and partly amorphous and more so. It is tough, light-yellow, greenish-yellow, or colourless, with a fennel-like smell and aromatic bitter taste. That used in pharmacy is exuded from incisions in *Canarium commune*, a Philippine Island tree, and is known as Manilla elemi. Mauritius elemi comes from *Colophonia Mauritiana;* African, from *Boswellia Frereana*, and probably other species native to Somali-land; American or Brazilian, from *Icica Icieariba*, *I. heptaphylla*, *I. Caranna*, etc.; and Vera Cruz or Mexican, from *Amyris elemifera*. All these trees belong to the order *Amyridaeeæ*,

Burseraccæ or *Terebinthaceæ*, as it is variously called. Though used as a constituent of a stimulating ointment and as incense. elemi is chiefly employed in the manufacture of spirit and turpentine varnishes. In the Philippines it is used in caulking ships and in torches.

Elephant. Any individual of either of the two species of Elephas, the sole living genus of the order Proboscidea (q.v.). They are the largest of the quadrupeds, extremely massive in build, walking on the tips of the five toes with which each foot is furnished, and on the cushion-like pad which unites them and forms a flat sole behind them. The skull is disproportionately large, but increase of weight is obviated by the large air-spaces, separated by thin bony partitions. The brain is small, scarcely exceeding



ELEPHANTS.
A, Indian (showing molar tooth); B, African (showing molar tooth).

that of a man in size; and though it is greatly convoluted, as might be expected from the intelligence of these animals, the hind brain, or cerebellum, is not covered by the cerebral hemispheres. In this particular, as in some others, the elephants show some affinity to the Rodents. The nose is prolonged to form a flexible proboscis or trunk, divided by a partition into two tubes, the extremities of which are the true external nostrils. This trunk, which in large specimens is about eight feet long, is of the greatest service to these animals, for it is extremely strong and of great sensibility. With it they can lift a cannon, or pick up a pin. It serves to carry food and water to the mouth, and can be converted into a syringe or a shower-bath. Its length compensates these animals for their short, muscular necks absolutely necessary to support the weight of the head and tusks, but too short to allow them to gather the succulent shoots and herbage on which they feed. They have only incisor and molar teeth; the former, popularly known as tusks, grow from persistent pulps, like the incisors of a rabbit or a mouse, and are present in both sexes in the African elephant, while in the Indian species they are absent or only partially developed in the female. There are no incisors in the lower jaw; and only one molar or at most portions of two, on each side in each jaw at one time. These, however, when worn, are replaced from behind; and in this way six molars above and below on each side are successively brought into use in the animal's lifetime. The skin is extremely thick, and scantily covered with coarse, bristly hair. The gait of the elephant is very different from that of other quadrupeds, and this arises from the fact that the thigh is set so as to form nearly a right angle with the body when the animal is at rest, and not bent up so as to make an acute angle with it, as in the horse and the cow, so that the knee in the elephant is much nearer the ground than it is in these animals. The eyes in both species are very small; but all the senses are highly developed.

Elephants have strong social instincts, and live in family associations or herds of from 20 to 100 individuals in the tropical and sub-tropical regions of the Old World. When on the march the cows and the young go in front, the bulls bringing up the rear, followed by the old bull who is lord of the herd. The males are polygamous, and the strongest either kills his rivals or expels them from the herd. Sometimes, however, old bulls are found singly or in pairs, and occasionally in small herds of from six to twenty. At the breeding season the males are said to be "must," from an Indian word signifying "drunk." They are then the most dangerous of all animals, being subject to wild outbursts of fury, and even in a domesticated condition they are utterly regardless of their keeper, upon whom they often turn in their rage. A "rogue" elephant is one that has been driven from a herd, and in consequence has become savage, cruel, and morose. "He is possessed not by sudden bursts of fury, but by a deliberate, brooding resolve to wage war on everything, and lies patiently in wait for travellers" (*Romanes*). The female is an affectionate mother, and usually bears but one calf at a time, though cases of twins are on record. The period of gestation is $20\frac{1}{2}$ months. The intelligence of these animals is very great, and, according to Professor Romanes, is only inferior to that of the dog and the monkey.

Elephants have been known from remote antiquity. The Greeks had abundance of ivory, and Solomon decorated his throne with it. The Carthaginians employed the African species in war more than 2,000 years ago, while the Indian species was probably utilised in the same way and also as a beast of burden at a still earlier period. They were employed in the pageants and games of the Romans, and they are still used for the same purposes in India.

Although the Indian elephant is still domesticated, and largely used as a beast of draught and burden, the African elephant only exists in the wild state, and it is on account of the ivory it yields that the latter species is so important. Ordinary tusks only average three to the hundredweight, so that immature animals must often be slaughtered. It is said that 15,000 are killed annually for the British market alone, and that the total annual

slaughter is about 75,000, which far exceeds the rate of increase. Indian elephants also furnish their quota, and a little of it is taken from living animals, as it is the custom to cut the tusks of domesticated elephants every ten years.

The Indian Elephant (*Elephas indicus*, the *Enelephas indicus* of some authorities) is found all over the wooded parts of the Oriental region, ranging eastwards to the frontiers of China and Sumatra and Borneo, and southward to Ceylon. The males stand about ten feet at the shoulder, and the females about a foot less; the trunk ends on the upper surface in a finger-shaped lobe; and there are four or five of the digits of the hind-foot which are furnished with nails. The difference in the head and ears and in the folds of the enamel of the molars in the two species will be seen by reference to the illustration.

The African Elephant (*Elephas* or *Loxodon africanus*) is said to range the continent south of the Sahara, but it is being driven back slowly but surely to the equatorial forests. The males stand a little over ten feet high at the shoulder, and the females about a foot less. There are only three nails on the hind-foot, and the extremity of the trunk has a small opposable process on the upper and lower surface. [DINOTHERIUM, MAMMOTH, MASTODON.]

Elephanta, an island in the Indian Ocean, in the presidency of Bombay, and 6 miles from the city of Bombay. The island, which received its name from the Portuguese on account of the figure of an elephant cut in the rock, is renowned for its grottoes or underground temples, which are very ancient Indian monuments. The principal of these temples, which are reached by a staircase leading to a terrace, is 130 feet in height, 123 in breadth, and 18 feet high, supported on many pillars of solid rock, and has a figure of the Hindoo Trinity of Brahma, Vishnu, and Siva, the creator, the preserver, and the destroyer. There are other caves carved with mythological subjects.

Elephant Hawk-moth. [HAWK-MOTH.]

Elephantiasis. This term has been applied to diseased conditions in which hypertrophy of the connective tissue of parts of the body leads to swelling. Two special uses of the word may be alluded to; in the first place, *Elephantiasis Græcorum* is used as a synonym for leprosy (q.v.). *Elephantiasis Arabum*, or Barbadoes leg, is a peculiar affection which appears to be brought about by blocking of lymphatic vessels. The disease is confined to tropical countries, and is not uncommon in India; it usually attacks adults, and does not in itself tend to shorten life. By some it has been maintained that the cause of the affection is a parasite.

Elephant Seal (*Macrorhinus elephantinus*), ranging from the Antarctic Ocean to California, though the northern form is sometimes made a distinct species (*M. augustirostris*). It is the largest known seal, and the old males have the snout developed into a kind of proboscis.

Elephant's Ear. [BEGONIA.]

Elephant Shrew, a popular name for any species of the insectivorous family Macroscelidæ. They are small African rodents, with a proboscis-like muzzle. They are also called Jumping Shrews, from their kangaroo-like mode of progression.

Eleusis was an important city of ancient Attica, 10 miles N.W. of Athens, near the Saronic gulf, at the east end of a height parallel to the shore. It was the chief seat of the important mysteries connected with the worship of Demeter and Persephone. The town was destroyed by Alaric in 396, and it is now represented by a small village.

Eleut (*Oliut*), a large branch of the Eastern Mongolians occupying the Ala-Shan highlands south of the Gobi desert, and stretching westwards from the Ordos region; said to take their name from Elentai, a prince of the dynasty founded by Jinghiz Khan. Later this term was extended to the western hordes whose domain reaches from the head waters of the Selenga to the Upper Irtish basin. They are divided into four sections: Zungar, Turgut, Khoshod, and Turbot, collectively forming the historical Durban-oirad or "Four Allies." Connected with them are also the Western Mongols, known to the Mohammedans as Kalmucks. The Zungar branch is now extinct, or absorbed in the Eleuts of the Ala-Shan Mountains, many of whom were driven thither from Zungaria in 1686 (Prjevasky, *Mongolia*, i. p. 231).

Elevation, in *Astronomy*, is the height of an object reckoned in terms of its angular distance from the horizon. In geometrical and architectural drawing, an elevation means a side view drawn without perspective—an aspect that is only physically correct when the object to be drawn is viewed from a great distance.

Elevators, a word generally used to signify a mechanical contrivance for raising things quickly from one level to a higher one. In America it often implies what in England is called a lift, and may represent anything of the above nature from the tray worked by a rope which raises dishes from an hotel kitchen to the restaurant to the elaborate apparatus which, by hydraulic power, lowers or raises passengers to or from the Mersey Tunnel or the stations of the South London Electric Railway. The name is also applied to contrivances—generally hydraulic—for discharging grain from barges or ships into warehouses, or *vice versâ*. This kind of elevator is much used in the United States and in parts of Europe (Antwerp, for example), and is generally hydraulic. The main parts are a continuous chain carrying buckets, and a travelling band of indiarubber or canvas. The buckets work vertically, and pour the grain upon the travelling band, which conveys it horizontally to the required destination. Another description of elevator consists of a huge double scoop which, as it descends into a bulk of grain, opens wide at the bottom and grasps a certain quantity upon which it closes, and then ascending and turning to the point desired opens again and drops the grain which it had taken up.

Elf, a Teutonic word, generally replaced in modern English by "Fairy" [FAIRIES], and when used alone signifying a sprightly, graceful, but somewhat mischievous child. It retains its original meaning, however, in many compounds; as *elf-arrows*, *-bolts*, *-darts*, *-shots*, *-stones* = flint implements (q.v.), for these were formerly supposed to be weapons used by the fairies against men and cattle; *elf-child* = a changeling (q.v.); *elf-land* = the land of enchantment, fairyland; and *elf-locks* = knots of hair mischievously twisted by elves or fairies, hence applied to hair matted and in disorder.

Elgin. 1. A coast county of Scotland upon the southern shore of the Moray Firth, between the counties of Banff and Nairn on the E. and W. respectively, and having Inverness on the S. The area is 340,000 acres, of which 103,000 are under cultivation. In the south of the county there are hills interspersed with fertile valleys, and there is much forest and heath. The sea-coast is, for the most part, flat, though in the middle of the coast-line of 30 miles there are sandstone cliffs. At each end of the line there are mounds of sand and gravel. There are several lochs, and the rivers Spey, Findhorn, and Lossie have fine scenery and afford good salmon-fishing, while trout abound in the lochs. Granite, felspar, mica, slate, and sandstone are the components of the rocks in the south. There are large quarries of freestone, and some of slate. The climate is mild, dry, and wholesome, and the lowlands are, for the most part, fertile. The country exports corn, whisky, salmon, and timber, and unites with Nairn to return one member to Parliament. The principal towns are Elgin, Lossiemouth, Forres, and Burghead. Morayshire is a name by which the county is also known.

2. The capital of the county of Elgin, is a parliamentary borough, uniting with five other towns, called the Elgin Burghs, to send one member to Parliament. It is situated on the Lossie, five miles above Lossiemouth, and 37 miles E. of Inverness, and is on a gentle slope surrounded by wooded hills. The High Street runs for about a mile E. and W., and among the public buildings are several churches, a hospital, museum, market rooms, assembly rooms, and the Elgin Institution. There are only some fragments left of the cathedral, which was founded in 1224, and was the finest in Scotland and rivalled Melrose. The final touch in its ruin was given by the Regent Murray, who stripped the lead from the roof in 1568. There are cloth factories, iron foundries, tanneries, and breweries, and a good trade in farm produce.

Elgin, JAMES BRUCE, EIGHTH EARL OF (1811–1863), was educated at Eton and Christ Church, Oxford, where he took a first class in classics and a fellowship at Merton College. In 1841 he entered Parliament as member for Southampton, and succeeded in the same year to the earldom. The next year he resigned his seat, and was appointed Governor of Jamaica. In 1846 he became Governor of Canada, and did much towards conciliating the discontented provinces. In 1849 he was made a British peer, with the title of Baron Elgin. In 1857 he was sent on a special mission to China, and, though he sent most of his troops to take part in subduing the Mutiny which had broken out in India, he succeeded the next year in negotiating the treaty of Tientsin. In 1859 he was Postmaster-General in Lord Palmerston's government. He succeeded Lord Canning in the Governor-Generalship of India, and died while on a tour in the northern provinces.

Elgin Marbles, a collection of bas-reliefs and statuary brought to England from the Parthenon of Athens by the seventh Lord Elgin in 1814. They are now in the British Museum, having been bought by the nation. Some question the propriety of their removal from their original site, but there is no question that they are a most valuable collection from an artistic point of view. Many nations possess casts of them, and they have been fully described.

El Haiyât, an Arab tribe of the Haurân uplands south of Damascus, specially remarkable for their extremely fair complexion. M. Rey describes their sheikh as "a man with blond beard like all the people of his territory" (*Voyage dans le Haurân*, p. 71). It is probable that the light colour of these Arabs is due to alliance with the Druzes [DRUZES], large numbers of whom removed from the Lebanon to Haurân about the middle of the century.

Elijah, one of the chief of the Hebrew prophets, who lived probably about 800 B.C., and whose special mission was to combat the foreign influence brought to bear by Ahab's Phœnician alliance and marriage with Jezebel. His life is set forth in the Books of the Kings.

Elimination, in *Algebra*, means the operation of removing a quantity from an equation by combining it with another equation. Thus, we may know the area of a circle in terms of its circumference, and also the circumference of a circle in terms of its radius. Combination of these two may be made to give us the area of a circle in terms of its radius, an elimination of the expression for the circumference being effected. Or two equations may exist each involving unknown quantities x and y. They may be so manipulated together that a resultant equation in x or in y only may be obtained by elimination of the other unknown. In astronomy the elimination of errors of observation by means of repetition of the observation in different ways is of much importance.

Eliot, GEORGE, was the pseudonym of MARY ANN EVANS, one of the greatest novelists of the 19th century. She was the youngest daughter of Robert Evans, a Warwickshire land agent, by his second wife. The baptismal Christian name of the future novelist was Mary Ann, but she usually signed herself Marian Evans. Her father was a man of unusual strength of character, and many of his distinctive qualities have been depicted in Adam Bede, the hero of the novel of that name, and in Caleb Garth, one of the most striking individualities in *Middlemarch*. Her mother, whose maiden name was Pearson, was understood to have

been the original of Mrs. Hacket in *Amos Barton*. Miss Evans was born at Arbury Farm, in the parish of Colton, Warwickshire, November 22, 1819. She had a sister and a brother, Christiana and Isaac, the latter being delineated in *The Mill on the Floss;* he also, in all probability, formed the subject of the notable sonnets entitled *Brother and Sister*. In the course of a few months, after Mary Ann's birth, the Evans family moved to Griff Farm. At five years of age Miss Evans was sent to school at Attleboro', where she remained for four years. Then she went to a boarding-school at Nuneaton, where she formed a close friendship with the principal governess, Miss Lewis, with whom she subsequently corresponded. Mrs. Evans died in 1836, and, Christiana Evans having married in the following year, Marian Evans now undertook the charge of her father's house. Masters came over from Coventry to instruct her in German, Italian, and music, and she was also an omnivorous reader of works in general literature. In 1841 Mr. Evans and his daughter removed to Foleshill, near Coventry, where Marian Evans established a firm friendship with Charles Bray, a philosophical writer, and his brother-in-law, Charles Hennell, the author of a rationalistic *Inquiry Concerning the Origin of Christianity*. Her new relationships had a destructive effect upon her religious views. She abandoned evangelicalism for scepticism, and it was with the utmost difficulty that her father persuaded her for a time to conform to the old rules of public worship. For nearly three years she devoted herself to a scholarly and able translation of Strauss's *Leben Jesu*, which was published in 1846 by her friend, Dr. John Chapman. At a later period she translated Spinoza's *Tractatus Theologico-Politicus*, and later still his *Ethics*. Losing her father in 1849, to mitigate the blow she went abroad, and resided with the Brays for some months at Geneva. Returning to London in March, 1850, in September of the following year she became assistant-editor of the *Westminster Review*. About this time she translated Feuerbach's *Essence of Christianity*, the only work to which she appended her real name. Thrown into friendly relations with Herbert Spencer and George Henry Lewes, her intimacy with the latter (who was separated from his wife) grew so rapidly that in 1854 they defied the usages of society by forming a non-legal union, which lasted until the death of Lewes in 1878. That this lamentable step was injurious to George Eliot from many points of view is well known.

When Lewes was contemplating his *Life of Goethe*, he and George Eliot visited Weimar and Berlin. On their return to England they resided successively at Dover, East Sheen, Richmond, and London. Drawn towards imaginative literature as she had been for some years, it was in 1856 that George Eliot made her first attempt at fiction, being urged thereto by Lewes. The appearance in *Blackwood's Magazine* of that pathetic sketch, "The Sad Fortunes of the Rev. Amos Barton"—the first story in *Scenes of Clerical Life*—created the deepest interest in literary circles. The volume of which it forms a part was never surpassed by the author in skill and delicacy of workmanship. In 1859 appeared *Adam Bede*, the most popular and the most human of George Eliot's larger works of fiction. The success of the novel was almost beyond precedent, but the writer suffered extreme annoyance for some time owing to the unfounded claim of a native of the Midlands, named Liggins, to the authorship. *The Mill on the Floss*, which is marked by tragic scenes and strongly individualised characters, was published in 1860, and *Silas Marner*, one of the most beautiful and idyllic of the author's works, in 1861. The publication of that remarkable story of Italian life, *Romola*, marked a new epoch in George Eliot's literary career. Tito, Romola, and Savonarola are among the greatest of her creations. *Felix Holt*, issued in 1866, was a link between a dying and a coming generation, but, from the artistic, as from other points of view, it was the least successful of the author's works. George Eliot visited France in 1865, and Spain in 1867, and after her return to England she made her first appearance as a poet with *The Spanish Gypsy*. High as she herself ranked this class of effort, her verse lacked spontaneity and fire to rise to the highest poetic level. The form was perfect, but the afflatus was largely absent. *Agatha*, *The Legend of Jubal*, and *Armgart*—further studies in poetry—appeared at intervals. In 1871–72 was published the novel of *Middlemarch*, which signalised the third and crowning epoch of George Eliot's career. This fine study of English provincial life stands to its author in the same relation that *Hamlet* does to Shakespeare. It is distinguished for its literary execution, its philosophy, and its profound studies of character. *Daniel Deronda*, the last of the brilliant series of novels by this gifted writer, appeared in 1876. It was decidedly inferior to *Middlemarch*, though it showed a singular grasp of Jewish sentiment and culture. This eloquent apology for the Jews did full justice to their noble aspirations and their unswerving faith. In 1878 Lewes died, and, after the first bitterness of the separation was over, George Eliot set herself to the task of preparing for publication her last work, *The Impressions of Theophrastus Such*. This volume of miscellaneous essays contained several admirable studies, including one on *Debasing the Moral Currency;* but, as a whole, the work was somewhat hard and laboured. To the surprise of many of her friends, George Eliot married in May, 1880, Mr. John Walter Cross, a gentleman who had known her for twenty years, and whose devotion and sympathy she warmly appreciated during her brief period of widowhood. The new union was destined to be of short duration. After a few months of foreign travel, Mr. and Mrs. Cross returned to England, to a house which they had taken in Cheyne Walk, Chelsea. On the 19th of December, 1880, George Eliot was seized with illness, which soon assumed an alarming character, and the world was startled by the announcement that she had passed away at midnight on December 22. She was buried by the side of Lewes in Highgate Cemetery. In 1883 her essays contributed to the *Westminster Review* were collected and published, and in 1884 Mr. Cross issued her journals and

letters in the form of a biography. George Eliot took a deep interest in the higher education of women and other questions of moment to her sex, but she rarely expressed her views on the public topics of the time. She was passionately enamoured of music, and was constantly to be seen at the popular concerts in St. James's Hall, and she had considerable taste and judgment in art. As to her religion, she had a deep sympathy with Auguste Comte and his system, though she declined to be absolutely bound by the doctrines of Comte or any other religious teacher. Her chief qualities as a novelist were reflectiveness, observation, humour, and pathos. As a story-teller she has been excelled by many of her own sex, but she outdistances them all in culture and intellectual strength. In sheer force and ability she deservedly ranks in close proximity to Scott, Dickens, and Thackeray; and, although it may be doubted whether her popularity will prove as wide as theirs in future generations, she will yet undoubtedly leave a powerful and an indelible impression upon English literature.

Eliot, Sir John (1592–1632), a champion of freedom of speech in Parliament, was born in Cornwall, and educated at Exeter College, Oxford. He entered at one of the Inns of Court, and made the Continental tour, in the course of which he made the acquaintance of Villiers, afterwards Duke of Buckingham. In 1614 he entered Parliament, and, owing to the good offices of Villiers, he was knighted in 1618, and the next year was appointed Vice-Admiral of Devon. In 1623 he got into difficulties with the Court over a question concerning his office, and in 1624 he was in Parliament as member for Newport. The next year saw the end of his friendship with Buckingham. In 1626 he represented St. Germans in Parliament, and, as leader of the House, headed the attack upon Buckingham, and was sent to the Tower for his pains. In 1628 he represented the county of Cornwall, and was a great supporter of the Petition of Right. In 1629, on the memorable occasion when the Speaker was held in the chair, Eliot proposed the resolutions. He was sent to the Tower and fined £2,000. He wrote much in prison, and there he died He was not a republican in principle, though his fate put him into the forefront of the battle for privilege of Parliament.

Eliot, John (1604–1690), called "the Indian Apostle," and "the Indian Evangelist," was born in Hertfordshire, and educated at Jesus College, Cambridge, where he graduated B.A. in 1622. He taught in a school, and took orders, but owing to difficulties on account of his religious views he went to New England, and was called to a pastorate at Roxbury, which he retained till his death. He took great interest in the welfare and conversion of the Indians, and established what was called the praying colony at Natick. He contended that the civil improvement of the natives must be attended to as well as the religious. He translated the Bible into an Indian tongue, and in 1666 brought out an Indian grammar, besides making many other translations and producing many writings.

Elis, a district in the W. of the Peloponnesus, along the coast, having Arcadia on the E. and Messenia on the S. It was watered by the Alpheus, and the capital was called Elis. In it was Olympia, whose games were so important in the Greek world that the dates were regulated by their recurrence, just as some English sportsmen will speak of such and such a thing happening in *Hermit's* year or in *Gladiateur's* year. [Olympiad.]

Elisha, a Hebrew prophet, the successor of Elijah, and the carrier on of Elijah's work in the school of the prophets. He was the moving spirit of patriotism during the wars with Syria. His life is told in the Books of the Kings.

Elixir, an Arabic word originally applied to the philosopher's stone, and later to a drink which was supposed to confer immortality. Latterly the name has been applied to different medicinal drinks or syrups. Most people have heard, if not partaken, of paregoric elixir. The idea of an elixir of life—in a modified sense—is not yet exploded, for quite lately a scientific man put forth the idea of a subcutaneous injection which was supposed to renew vigour and prolong life indefinitely.

Elixir Vitæ was the great elixir, known under the various names of the *great medicine*, the *magisterium*, the philosopher's stone, etc., for which the alchemists of the 13th to the 15th century so ardently searched. The powers ascribed to it were practically unlimited; thus, besides its power of healing all human diseases, it was to convert all metals into gold. Recipes for the preparation of this and other minor elixirs are to be found in various alchemistic writings, but also are so disguised in mystical and symbolic language as to be frequently quite unintelligible.

Elizabetgrad, a Russian town on the Ingul, in the government of Kherson, and 130 miles W. of the town of that name. It is a regularly-built town, with wide streets, in many cases lined with trees. It has suburbs, and a citadel with several bastions, and is the head of the military colonies of that district.

Elizabeth, an American city, capital of Union county in the state of New Jersey, 14 miles S.W. of New York, with which city it has railway and steam communication. It is in a fertile district, and is well-built, and has many churches, schools, a court house, city hall, and other public buildings. There are foundries and oilcloth factories, and a factory of Singer's sewing machines.

Elizabeth (1533–1603), Queen of England, one of the most popular and most remarkable monarchs that England has had. The "man-minded offshoot" of Henry VIII.—"*le Roi Elizabeth*" as the French used to call her—was born at Greenwich, being the daughter of Anne Boleyn. Much of the peculiar nature of her qualities was the natural outcome of the circumstances of her early life. Made much of at one time as a likely heir to the crown, becoming at another an object of jealousy and dislike to her sister Mary, and in no small danger of losing her head, it is not surprising that

a profound power of dissimulation was a marked feature in her character. It was during this period of her life that she developed the circumspection, prudence, and tact that enabled her to become an almost autocratic ruler, and the valuable gift of an unerring judgment in the choice of counsellors. When the death of her sister Mary in 1558 put her upon the throne, she had a difficult course to steer, but thanks to her own wisdom and to that of Cecil, Walsingham, and other like-minded advisers, she evaded all the rocks and shoals in her way. Her dislike to marriage, which has puzzled both her contemporaries and later generations, may have been owing to a combination of causes, one of the chief having, no doubt, been a conviction of ability to rule, and a disinclination to sacrifice any portion of her liberty. Her coquetting and vacillating dealings with the Duke of Alençon may have been partly owing to the dictates of policy, and partly to that womanly weakness that she sometimes showed, and which appeared all the greater by contrast with her usual manlike qualities. It is also to this weakness that we must set down the one great political blunder of her life—her treatment of Mary Stuart. Feminine jealousy seems to have been as active an element in her conduct in this case as any possible apprehension on the score of Mary's religion and nearness to the throne. It is difficult to say how far the colonising enterprise of her reign was owing to causes independent of her, and how far to her political wisdom. Some think her to have forwarded the schemes of Drake, Raleigh, and the other adventurers of the age, simply from motives of mercantile prudence, in this respect showing herself the worthy granddaughter of the astute Henry VII. What seems to us, judging from a distance, the absurdly exaggerated reverence felt for her by her courtiers bears witness to the extraordinary strength of her character, for it is impossible to suppose it all to have been lip-service and high-flown romance. Her conduct with regard to her favourites, Leicester and Essex, has puzzled many, but to be her favourite must have been like playing with a tiger. She was in no way backward in letting them see and, on occasion, feel her claws. She knew how to value Burleigh, and, no doubt, thoroughly understood Leicester, and found some ironical amusement in befooling Alençon, and puzzling her own "good people." The masterly policy of posing as the champion of a Protestantism which she probably cared little for, and the glory of having humbled the first military power of the world, may fairly be divided between the queen and her gifted advisers. Knowing when and how gracefully to yield, she reigned in her people's hearts with a more absolute sway than has been attained by any English ruler before or since. Her good education and love of learning was not so unusual a quality in her day as it became later. In this respect Lady Jane Grey was at least her equal. There is some mystery attaching to her early connections with Seymour, High Admiral of England, who had paid her attentions when she was a girl of sixteen. It is just within the bounds of possibility that faithfulness to his memory may have had something to do with her determination not to marry. It should not be forgotten that it is said that we owe Shakespeare's *Merry Wives of Windsor* to Elizabeth's desire to see something more of Falstaff and his oddities.

Elizabeth, Empress of Russia (1710–1762), was the daughter of Peter the Great and Catherine. In 1741 she succeeded to the throne owing to a conspiracy of the old party, which was opposed to the innovations which had been introduced by Peter the Great. Elizabeth was beautiful and licentious, and her government, which was carried on by a succession of favourites, was tyrannical and capricious, and banishment to Siberia was freely used. She patronised literature, and corresponded with Voltaire, to whom she supplied material for his life of Peter. She founded the University of Moscow, and the Academy of Fine Arts at St. Petersburg. Besides her lovers she had a husband of low rank. She had a war with Sweden, which ended with the Peace of Abo, she aided Maria Theresa in the War of Succession, and she was engaged in the Seven Years' war at the time of her death.

Elizabeth, St., of Thuringia (1207–1231), was born at Pressburg. In 1221 she married Louis of Thuringia, and the pair seem to have led a kind of ideal life, he devoting himself to knightly deeds, and she founding hospitals and attending the sick and poor. Louis died while on a crusade, and his widow died in one of her own hospitals. Four years after her death she was canonised by Gregory IX. A church was built over her tomb and a monument, which is one of the finest examples of Gothic in Germany.

Elizabeth of Bohemia (1596–1662) was the daughter of James VI. of Scotland (James I. of England) and Anne of Denmark. She was born in Fife, and resided while in Scotland at Linlithgow. When she came to London, Combe Abbey was appointed as her place of residence, and here she was brought up. She then removed to Hampton Court, Whitehall, and Kew respectively. Charles IX. of Sweden sought her hand for his son, but she was married to Frederick. Elector Palatine, who was elected to the throne of Bohemia. She seems to have been flighty and extravagant, and she did not win the hearts of the inhabitants of Prague. Prince Rupert, of Civil war renown, was her third son. Her husband was deprived of the Bohemian crown by the battle of Prague. Elizabeth came to England at the Restoration, and died in London. She was popular in England, and was generally known as the Queen of Hearts.

Elizabethan Architecture, a combination of debased Pointed and degenerate Italian architecture which prevailed in the time of Elizabeth and James I., and succeeded the Tudor style. Though improper in style, it was picturesque in appearance, among its features being embayed windows, long galleries, and elaborate chimney stacks.

Elk (*Alces machlis*), the largest living species of the Deer family. It is a native of Arctic

America, where it is also called the Moose, and of northern Europe and Asia, though much more numerous in the western than in the eastern hemisphere, where its distribution has been much restricted since the days of Cæsar (*De Bello Gall.* vi. 27). An adult male stands about seven feet high at the shoulders, and has huge palmate antlers, which form effective weapons of defence, and which have been known to weigh 40 lbs. The antlers appear first as straight bony projections when the animal is about nine months old, reaching their full length in the fifth year; and in each succeeding year till the fourteenth, when the animal is considered full-grown, they increase in breadth and add a fresh point to the broad, spreading margins. The females have no antlers. The coat is harsh and close-set, deep blackish-brown in colour, and forms a kind of a mane; the neck is short and thick, with a pendulous swelling covered with hair under the throat, just behind the angle of the jaw; the limbs are long, and the tail rudimentary. Their pace is generally a shambling trot, and their long legs enable them to get over the ground very quickly. In Sweden they were formerly trained to draw sledges, but this practice has long died out. They are, for the most part, solitary and very wary, so that moose-hunting, according to Sir John Richardson, is the greatest of an Indian's acquirements. They feed on bark and the shoots of bushes and trees. The skin makes excellent leather, and the flesh good venison, the tongue and the muffle, which is large and prominent, being specially prized. A few are still carefully preserved in Lithuania.

Ell (from Latin *ulna*, the elbow), a measure formerly commonly much used in Europe, and supposed to be the length of the forearm. It is thought to have been introduced into England from France during the Tudor period. There is much difference between the ells of different nations—that of England being 45 inches, that of Scotland a little over 37 inches, and that of Flanders 27 inches.

Ellenborough, Edward Law, Earl of (1790–1871), was the son of Baron Ellenborough, Lord Chief Justice of England. He was educated at Eton and St. John's College, Cambridge, and in 1814 entered Parliament, retaining his seat until 1818, when the death of his father removed him to the House of Lords. In the same year he became a member of the Duke of Wellington's government. From 1828 to 1830 he was President of the Board of Control, and in 1834 and in 1841 he was in Sir Robert Peel's ministry. He then became Governor-General of India, arriving in that country in time to direct the Afghan war of 1842. In the next year Sir Charles Napier conquered Scinde, and then followed the conquest of Gwalior; but Lord Ellenborough's policy and manners gave dissatisfaction at home, and the Company recalled him in 1844. He received the thanks of Parliament, the Grand Cross of the Bath, and an earldom. In 1846 he was First Lord of the Admiralty, and in 1858 he was President of the Board of Control in Lord Derby's government, but resigned in consequence of the general disapproval of a despatch he wrote censuring Lord Canning's policy as Governor-General. He did not again take office.

Ellice Islands is the name given to some groups of coral islands in the South Pacific, lying in lat. 5° to 11° S. and long. 177° to 180° E. The Polynesians who inhabit them are mostly Christians, and the islands belong to Great Britain. The only product of importance is copra.

Ellichpur, an Indian city in the north of Berar, once the capital of the Deccan. The town is decaying. but contains a ruined palace, some tombs of nawabs, and a shrine. The district of the same name is in the commissionership of East Berar, and has an area of 2,772 square miles.

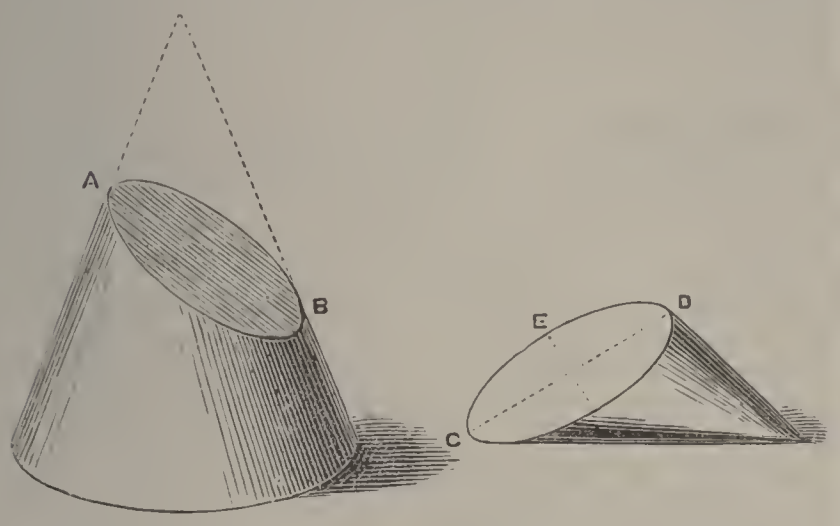
Ellicott, John (1707–1772), a clockmaker and man of practical science in the 18th century. He was renowned for the beauty and excellence of his workmanship, and was appointed clockmaker to George III. In 1736 he made improvements in the pyrometer, in 1738 he became a F.R.S., and in 1739 he wrote papers on the influence of two pendulums on each other. Other of his contributions to science were essays towards the discovery of the laws of electricity; a compensated pendulum, experiments on the moon's motion, and an examination into the specific gravity of diamonds.

Elliot, Ebenezer (1781–1849), called "the Corn Law Rhymer," was born at Masborough in Yorkshire. His love of nature and of contemplation gained him, as such qualities generally do, the reputation of being dull and idle. But he studied botany, and worked hard at educating himself. He produced his first poem, *A Vernal Walk*, at the age of seventeen. After working for a time in a foundry, he was an iron-merchant in Sheffield (1831–1837). His *Rhymes* were produced at intervals, and were collected into one volume with the *Ranter*. In 1829 appeared his *Village Patriarch*. Many of his pieces contain good descriptions of Yorkshire scenery.

Elliotson, John (1791–1868), an English physician born at Southwark. He took the degree of M.D. at Edinburgh and at Cambridge, and then studied in London, and in 1817 became assistant physician and, later, physician of St. Thomas's Hospital. He lectured at St. Thomas's till 1831, introducing there the new practice of clinical lecturing. In 1834 he became physician to the North London Hospital, but a few years later resigned all his appointments, owing to his having adopted mesmerism as a therapeutic agent. In 1849 he became physician of a mesmeric hospital. Dr. Elliotson made many valuable discoveries in medical practice, among them being the use of acupuncture in neuralgia, the value of quinine, the importance of the stethoscope, and the employment of many substances in different diseases.

Ellipse, one of the conic sections, every point of which has the property that its distance from a fixed point or *focus* is a constant fractional portion of its distance from a fixed line or *directrix*. This definition renders the ellipse a closed curve symmetrical about two axes at right angles to each

other—the one parallel to, and the other perpendicular to, the given directrix. There are two foci and two directrices, and an important property that may be said to define the curve is that the



sum of the distances of any portion of the curve from the two foci is a constant length, equal to the major or longer axis of the ellipse. The curve is completely determined by its two axes, major and minor. Their point of intersection is called the centre of the curve, and possesses the usual properties of that point. [CENTRE.] If the semi-axes are a and b the area of the curve is πab. When the axes become more and more nearly equal the curve approximates to the circle, which is therefore only a special case of ellipse. The length of the circumference cannot be exactly expressed in a finite number of terms, though close approximations have been found. The eccentricity of the ellipse is measured by the distance from focus to centre divided by the semi-axis major. The curve may be drawn by the trammel or elliptic compass.

Ellipsoid, one of the quadric surfaces, or surfaces such that any plane section gives a conic (q.v.) The true ellipsoid has three axes of symmetry at right angles to each other, each of different length. They meet at a point called the centre, which bisects them and all chords or diameters, as they are called, which are drawn through it and terminated by the surface. Any section of an ellipsoid is an ellipse, but there are two directions in which sets of circular sections may be obtained; the circle is regarded as a special case of ellipse. If a, b, and c are the semi-axes of an ellipsoid its volume will be $\frac{4}{3}\pi abc$. If two of these are made equal a surface called a *spheroid* is obtained that may be generated by the rotation of an ellipse about either of its axes. If rotated about its major axis, a *prolate* spheroid is produced; if about its minor axis, an *oblate* spheroid. The shape of the earth is an instance of the latter. If all three axes be made equal the sphere is obtained, which must, therefore, be regarded as a special case of ellipsoid. All sections of a sphere are circular.

Ellis, SIR HENRY (1777–1869), sometime chief librarian of the British Museum. He was born in London, and educated at Merchant Taylors and at St. John's College, Oxford, of which society he became fellow. He was for a time sub-librarian of the Bodleian Library, from which he migrated to the British Museum, being chief from 1827 to 1856. Among his works are an edition of Brand's *Northern Antiquities*, the introduction to the Domesday Book, and a collection of original letters illustrative of English history.

Elliston, ROBERT WILLIAM (1774–1831), an actor born in London. His first appearance on the stage was at Bath, where he played Romeo in 1793. He came to London, and played at the Haymarket and at Covent Garden. He was twice a member for some time of the Drury Lane Company, and for five years was lessee and manager, but became bankrupt, and appeared later at the Surrey Theatre. Lamb appreciated him, and Leigh Hunt praises his comedy and his tragedy.

Ellora, a village of Hindostan, in the Nizam's dominions in the Deccan, 12 miles N. of Aurungabad. Its ruins are surrounded by a stone wall, but its great feature is its cave temples in the slope of a hill of red granite. The general form is that of a horseshoe of one mile in extent. Some of the temples are caves, and some are open at the top, and they are some Buddhist and some Brahmin. The largest and finest is dedicated to Siva, and consists of a solid mass of rock one hundred feet high, round which are excavated galleries and colonnades having the whole Hindu Pantheon elaborately carved upon them. A smaller temple is the Buddhist cave of Visvakarma. This has a curved roof, and contains a colossal image of Buddha.

Ellore, a town in the Godavari district of the Presidency of Madras. The town is healthy, and is the head of the sub-district, and has a population of which the majority are Hindu. The manufacture of carpets is largely carried on.

Ellwood, THOMAS (1639–1713), a Quaker author, born at Thame in Oxfordshire. In 1660 he was led to join the Society of Friends by the preaching of Edward Burroughs. Soon after this he published an *Alarm to Priests: a Message from God to Awake Them*. His religious views brought him into prison. He became reader for Milton, and having been forced by ill-health to leave London himself, he in 1665 obtained lodgings for Milton at Chalfont in Bucks, and it was here that a remark of his led to Milton's writing *Paradise Regained*. In 1705 Ellwood issued a *Sacred History* dealing with the Old Testament, and in 1709 the *Sacred History of the New Testament*. He also wrote a poem called *Davideis*, and an autobiography, which is valuable as throwing light upon the condition and habits of the sect at that time.

Elm, the popular name for the various trees and shrubs forming the genus *Ulmus*, a group of about a dozen species native to the North Temperate region, and forming the type of the small apetalous order *Ulmaceæ*. They have furrowed, corky bark; scattered, simple, oblique leaves with caducous stipules; tufts of hermaphrodite flowers, generally produced before the leaves; from four to nine lobes to the bell-shaped, persistent calyx; an equal number of stamens; and a two-chambered, one-seeded samara (q.v.) with a membranous wing all

round it. The species are very variable, becoming mere shrubs in the far north, but forming large timber-trees, 60 to 100, or even 150 feet high, farther south. *U. campestris*, the common or English elm, most common south of the Trent, reaches the greatest height, and often sends out very long, horizontal limbs. It is multiplied by suckers —its fruit, in which the seed is above the centre, seldom ripening. It is, partly on this account, believed not to be indigenous in England. It attains maturity at 150 years; but may live to 600 years. The Wych or Scotch elm, *U. montana*, more common north of the Trent, has a more drooping habit, no suckers, and its seed in the centre of its fruit. The American elm, *U. Americana*, has its samara fringed with hairs, and another American species, the Slippery elm, *U. fulva*, has a mucilaginous inner bark, useful as an ointment. Elm leaves form a useful fodder, and the branches of the Wych elm were formerly used for bows. The whitish sapwood is as strong as the brown heartwood and used to be made into linen-chests and hollowed out into water-pipes. Being durable when alternately damp and dry, elm-timber is used for keels and pumps; but is now mainly employed in coffin-making. In Italy the tree is still used, as in the time of Virgil, as a prop for the vine. It is a favourite avenue tree, the soft-wood Dutch variety having been largely planted for this purpose during the last two centuries.

Elmalu, a town in Lycia, Asia Minor, 45 miles W. of Adalia. The chief industries are dyeing, and the manfacture of red leather, and there is some trade.

Elmina, a British town on the west coast of Africa, 5 miles W. of Cape Coast Castle. It is a large and dirty native town occupied by traders and fishermen. It is protected by a castle. It passed from the Portuguese to the Dutch, and was the capital of their Gold Coast possessions, and was ceded by them to Great Britain.

Elodea canadensis, or *Anacharis Alsinastrum*, the American water-weed, a submerged aquatic plant belonging to the order Hydrocharidaceæ. Its long, much-branched stems are very brittle, and, as they root freely at the nodes, the plant, broken up by water-birds, has spread rapidly, though, as it is diœcious, it does not seed in England. Its whorled, linear-oblong leaves clearly exhibit the rotation of the protoplasm in their cells. Introduced from America into Ireland about 1836, and into England about 1841, it spread rapidly throughout our rivers, canals, and ponds, and has since proved a great hindrance to mills and to navigation.

Elohim, a Hebrew name for God, perhaps akin to the Arabic *Allah*. It is a more generic name than Jehovah, which is confined to the God of the Jews. It is in the plural form, and many conjectures have been started to account for this peculiarity.

El Paso, a Mexican town in the State of Chihuahua, on the Rio Grande, 340 miles S.W. of Santa Fé, and near the frontier of New Mexico. The name is derived from its being the pass between Mexican and United States territory, and is applied to a number of settlements in the same valley along the Rio Grande. The valley is fertile, and produces wine and brandy, but the town is wretched. A railway bridge over the river connects El Paso with a town of the same name in Texas.

Elphinstone, Hon. Mountstuart (1778–1859), the 4th son of Lord Elphinstone, entered the Bengal Civil Service at eighteen, and was appointed attaché to the British resident at the court of the Peishwar. He was then attached to General Wellesley's mission to the Mahratta chiefs, and took part as aide-de-camp in the battle of Assaye. In 1808 he was sent on an important mission to Cabul and Peshawur, which resulted in a satisfactory treaty. In 1819 he was appointed Governor of Bombay, and retained the post for seven years. He advanced the codification of the laws, and opened many schools, and his efforts in this direction were acknowledged by giving his name to a college. In 1841 he published his *History of India*. He was offered the post of Governor-General of India, but he declined that and other similar offers.

Elphinstone, William (1431–1514), a Scottish bishop and statesman, born at Glasgow, and educated at the grammar school there and at the University, where he graduated M.A. about 1451. After taking orders, and officiating in Glasgow for four years, he went to Paris to study canon and civil law, and worked for six years there as a professor. Returning to Scotland he became Rector of Glasgow University, and in 1478 a member of the Privy Council. King James III. made him Bishop of Ross for the ability he displayed in bringing about a good understanding between the Scottish court and Louis XI. of France. Later he became Bishop of Aberdeen, and Lord Chancellor. In 1488 he was sent to negotiate a marriage between James IV. and the Emperor Maximilian's daughter. From 1492 he was Lord Privy Seal, and the king put great trust in him. He is thought to have obtained the papal bull for the foundation of Aberdeen University, and was the principal founder of King's College, as he left a sum for its erection and endowment, and the maintenance of a bridge over the Dee. He wrote a *History of Scotland*, now among the MSS. of the Bodleian, and the lives of some Scottish saints.

Elsinore, a Danish seaport on the island of Zealand, on the Sound, which is here $3\frac{1}{2}$ miles broad. It is 24 miles W. of Copenhagen, and has two churches, a school, and a custom house. The inhabitants are engaged in commerce, seafaring, and in traffic with Helsingborg, the Swedish town on the opposite side of the Sound. The Castle of Kronborg, built by Frederick II. (1580), commands the Sound, and till the redemption of the Sound dues in 1857, all vessels had to salute the Castle and pay toll there. There is a good view from the lighthouse, which has a fixed light at a height of 113 feet.

Elssler. Fanny (1810–1884), and Thérèse (1808–1878), two dancers born at Vienna. They

made a great impression at Berlin in 1830, and were well known in all European capitals. A visit to America in 1841 brought them fresh triumphs. They retired in 1851, and Thérèse was ennobled upon her marriage with Prince Adalbert of Prussia.

Elster, the name of two German rivers. 1. The White or Great Elster rises in the W. of Bohemia, flows N. to Saxony, and joins the Saale near Halle, after a course of 115 miles. The Pleisse and Parde flow into it at Leipzig. 2. The Black Elster rises in Saxony, flows N. into Prussia, and then N.W. into the Elbe near Wittenberg, after a course of 100 miles. The Pulsnitz and the Röder flow into it.

Elswick, a township adjoining Newcastle, chiefly noted as being the spot where the great engineering and ordnance works of Armstrong, Mitchell and Co. are situated. These occupy an area of 125 acres, and have a mile of river frontage, and at times employ as many as 14,000 people. Elswick Park is now a recreation ground.

Elton, CHARLES ISAAC, Q.C. (b. 1839), a writer upon law and ethnology. He was born in Somerset, and educated at Cheltenham, and Balliol College, Oxford, where he graduated, and was elected a fellow of Queen's College. He was called to the bar in 1865, and has sat in Parliament for W. Somerset. His legal works are mostly upon outlying points of law embodying old and local customs, such as Borough English. In *Origins of English History* he urges the importance of the Celtic element in the population of England.

Elu, the ancient language of Ceylon, still spoken in modified form by the Sinhalese natives of the southern half of the island. It has long been cultivated, and is written with a peculiarly elegant alphabet somewhat resembling the Telugu of Madras, and, like it, derived from the Devanagari [DEVANAGARI] of the Asoka inscriptions. Elu holds a somewhat intermediate position between the two great Sanscritic and Dravidian linguistic families. It abounds in grammatic forms, and is certainly much older than any of the Prakrits though grouped by Childers and Beames with the Neo-Sanscritic tongues, owing to its numerous Sanscrit and Pali elements; but in its structure it shows more affinity for the Dravidian, though in many respects differing essentially from that family (Caldwell, *Grammar of the Dravidian Languages;* Petchel, *Races of Man*, English ed., p. 454).

Elutriation, a process of separating small particles of earthy materials from heavier ones by means of water. It is used in the pottery and pigment industries.

Elvan, a Cornish term for veins of a crystalline-granular mixture of quartz and orthoclase-felspar, intermediate between granite and eurite. They mostly proceed from granite bosses, penetrating both granite and surrounding slate, and frequently enclosing angular fragments of slate. They vary in width from a few inches up to 300 feet, and in Leinster they can be traced for miles in parallel bands 200 to 300 yards apart. The rock of which they are composed is termed *elvanite.*

Elvas, a town of Portugal in the province of Alemtejo, near the Spanish border, 12 miles N.W. of Badajos. It is situated upon a height which, with two on each side, is defended by a castle, and its situation under former conditions was well-nigh impregnable. The streets are narrow and crooked, but there are many good Moorish houses. The cathedral is a mixture of Moorish and Gothic, and there is a Moorish aqueduct 15 miles long, which crosses a valley on four sets of arches at a height of 250 feet.

Elves. [FAIRIES.]

Elwes, JOHN (1712–1789), was a wealthy miser or rather monomaniac, born at Southwark, and educated at Westminster. In his younger days he travelled on the Continent, and was fond of riding and hunting; but a sudden inheritance from a wealthy uncle, whose name he took, developed in him the eccentricities that made him notorious. He was an amiable miser, since it was only on his own person that he begrudged expenditure, while he did many a kind action, and kept up a good stable and kennel. He represented the county of Berkshire in Parliament from 1774 till his death.

Ely (in Latin *Elia*), a cathedral town of Cambridgeshire, on a height on the left bank of the Ouse, 15 miles N.E. of Cambridge. It consists of one principal street, from which branch several smaller ones, and which has a market-place in the centre. The most notable of its buildings is the abbey-cathedral of St. Etheldreda, on the site of a monastery founded by her in 673. It is 517 feet long from east to west, and the western tower is 270 feet high. There is a beautiful Norman nave, and most of the succeeding styles have been harmoniously incorporated. The Precincts are entered by a fine gateway of Richard II.'s time. The church of the Holy Trinity is a good specimen of 14th century architecture. There are a Town Hall, a Corn Exchange, and a cattle market, and some very old houses. The town has no special manufactures, the industries of the neighbourhood being chiefly agricultural, and there are several market gardens near it. A sight of Ely from the railway when the floods are out gives a good idea of its former appearance.

Elyot, SIR THOMAS (d. 1546), an English man of letters, born in Suffolk or in Wiltshire, and educated at Oxford or at Cambridge. He was Clerk of Assize on the Western Circuit, and afterwards clerk of the King's Council, and was employed on different embassies. Most of his life, however, seems to have been passed in a struggle with poverty. He had much reputation as a scholar, his chief works being a *Latin Dictionary* of encyclopædic nature, and the *Governor*, a book treating at length the education and bringing up of the young.

Elysium (or sometimes the ELYSIAN FIELDS), in ancient times the supposed habitation of the blessed when they have departed this life. Its exact position in space was never definitely settled, being variously put at the outside of the earth, at the antipodes, at the centre of the earth, and in the

Fortunate Isles (now the Canaries); but it was an abode of physical and intellectual delight from which all care and toil were banished.

Elze, FRIEDERICH KARL (1821–1889), a German scholar who studied and wrote upon Shakespeare. He was born at Dessau, and made part of his studies in Great Britain. From 1875 till his death he was Professor of English Language and Literature at Halle. He edited *Hamlet*, wrote *Essays on Shakespeare* and *Notes upon Elizabethan Dramatists*, and a *Biography of Lord Byron*.

Elzevir, the name of a noted family of printers and publishers who flourished at Amsterdam and Leyden in the 17th and late 16th centuries. The best-known are LOUIS, who was the first to distinguish in printing between *u* and *v*; MATTHEW and ABRAHAM, who with Buonaventura produced the highly-prized 12mo and 16mo edition of Virgil, Terence, etc.; ISAAC, JOHN, and PETER, who worked at Utrecht. It was chiefly for its editions of the Latin classics that the house was renowned, other houses, notably the Étiennes of Paris, excelling them in Greek and Hebrew editions. It is rare to find an antiquary or bibliophile spoken of in fiction without mention of his valued "Elzevirs."

Emancipation, a solemn act by which under the Roman law a father divested himself of his power over his child, so that the child became *sui juris*. This cannot happen under English law, but by the French law a father or mother (being a widow) may by a simple declaration emancipate a child at the age of 15 years, and the marriage of a child, at whatever age, operates as an emancipation. An orphan of the age of 18 years may be emancipated by a decision of the *conseil de famille*. The effects of emancipation are to render the child competent to act generally on his own account in all matters of a purely administrative character, but he remains subject to all former disabilities in respect of the alienation of capital, of real estate, of loan transactions and the like. If a trader, his capacity is unlimited.

Emanuel, called "The Great" (reigned 1495–1521), King of Portugal. His reign is spoken of as the "Golden Age of Portugal," for during it were reaped the fruits of the discoveries of Vasco da Gama, Cabral, and Amerigo Vespucci, Albuquerque's discovery of a passage to the East Indies; and the acquisition of Goa, the Brazils, and the Moluccas. The commerce of Portugal, too, reached its highest prosperity, the evil effects of Emanuel's expulsion of the Moors and Jews from his dominions not yet being felt. The king was a patron of learning, and wrote memoirs on the Indies.

Emballonurine Alliance, one of the two groups into which the sub-order Microchiroptera is divided. The tail perforates the membrane between the thighs and appears on its upper surface, or is produced beyond the truncated membrane. [BAT, 2.]

Embalming, the process of preserving bodies —human or other—from decaying by the use of medicaments. Many nations, including the ancient Peruvians of South America, have employed the art; but it is chiefly known to us from its use among the ancient Egyptians, owing to the number of mummies which fill our museums. Herodotus gives some interesting details of the process, from the elaborate system employed by the wealthy to the comparatively simple one that served the turn of the poor. The Egyptians not only embalmed human bodies, but also those of their sacred crocodiles and cats, the latter of which a few years ago underwent the sacrilegious degradation of being shipped in quantities to Europe for manure, just as their masters have become a stock curiosity for museums, and, it is said, have before now served as fuel on the overland railway. The most usual form of embalming among the Egyptians was to remove the brain and viscera and to fill up the cavity with aromatic and bituminous substances, and to wrap the body in cloth steeped in resinous materials, and then put it in a highly ornamented coffin. The duration and completeness of the process depended, like the pomp of a modern funeral, upon the amount of money expended. Many modern systems of embalming have been employed, some of which profess to preserve the whole body—flesh, skeleton, and viscera alike. By one process the body is petrified, and a table has been constructed out of human remains, quite solid, and taking a high polish.

Embankments, in *Engineering*, are employed for railways, elevated canals, roads, reservoirs, etc. In the case of railways and the like, they are only subject to vertical pressures due to the loads they carry and to their own weight; their dimensions are therefore calculated in relation to this and to the angle of repose (q.v.) of the material employed in their construction. Embankments for reservoirs or defence from encroachments of water have to withstand the lateral pressures of the water on one side of them, and must also be rendered impervious to water in case they should be gradually undermined. [DAM.]

Embargo (Spanish from a Low Latin word *imbarricare*, and from *barra*, a bar) generally implies a prohibition in time of war laid by a state upon foreign ships, especially the enemy's, to prevent their leaving the ports they happen to be lying in. The word is also used to signify the arrest of a ship or merchandise by process of law, and also in the general sense of a requisition.

Ember Days, certain ecclesiastical seasons set apart for praying for a blessing upon the fruits of the earth. The word is said to be a corruption of *quatuor tempora* (four seasons), and the uniform times for holding them were fixed by the Council of Placentia in 1095. These times are the Wednesday, Friday, and Saturday after the 1st Sunday in Lent, Pentecost, the Feast of Holy Cross (14th September), and the Feast of St. Lucy (13th December). The Sunday after the Ember week is generally chosen for Ordinations.

Emberiza, a genus of birds formerly classed under the order *Insessores* and tribe *Conirostres*, and closely allied to the finches. It includes the yellowhammer, the various buntings (q.v.), the nonpareil and rice-bird of the Southern United States, and perhaps the whydah birds. All are largely insectivorous, though their main food is seed.

Embezzlement (from the old French word *besler* or *embesler*, to filch) is another term for stealing, but more particularly applicable to stealing by clerks, servants, and others in official positions of money or goods received by them on account of their employers. It is distinguishable from larceny, which is the taking or misappropriation without the will of the owner, which does not apply where a clerk, servant, or agent is entrusted with funds; but, in embezzlement, the offender *intercepts* and misapplies money or other things, and this constitutes the offence under the statute. The offence is a felony, and punishable by penal servitude or imprisonment, and in the case of a male under the age of 16 by whipping in addition to imprisonment. In case a larceny is proved upon indictment for embezzlement the offender may be convicted of the former offence and *vice versâ*. Any number of distinct embezzlements not exceeding three committed within a period of six months may be joined in the same indictment. Partners stealing or embezzling money, etc., the property of the partnership, may now be convicted and punished as if they had not been such partners. [LARCENY.]

Emblem (from Greek *emballein*, to insert) originally signified inlaid or mosaic work. It now is restricted to a picture or representation which has a secondary signification beyond that presented to the eye. For instance, the dove or lamb is the emblem of innocence, the serpent or owl that of wisdom, the pelican that of the Church, and so on.

Embolism. [PYÆMIA.]

Embolus. [VEINS.]

Embossing, the practice of raising figures in relief half, high, or low (mezzo, alto, basso rilievo) upon surfaces such as paper, wood, leather, bronze or the like. Some substances are embossed by means of dies which under great pressure depress the parts not intended to be in relief. A method of embossing upon wood is to depress the parts intended to be in relief, then to plane the wood to a level with them, and to soak it in water, when the depressed parts rise to their former level.

Embracery (from the French word *embraseur*) is an attempt to corrupt or influence a jury in favour of one of the parties in a suit. It is punishable by fine and imprisonment. The crime is complete whether the jury on whom the attempt is made give any verdict or not, or whether the verdict be true or false.

Embrasure, a term employed in fortification to denote an opening in a wall or embattlement through which a gun may be trained, or the space in a wall sloping laterally towards a window. In the case of the embrasure for a gun the narrow part is inward, the sides sloping outward to admit a wider lateral range for pointing a gun, in the case of a window the wider part is towards the interior. An embrasure may be either direct, *i.e.* at right angles to the side of the wall through which it is pierced, or oblique, *i.e.* at an acute angle with such side.

Embroidery, a figured design or pattern worked by the needle upon muslin or stuff, the material for the figure being generally gold, silver, or silk thread. Muslin stretched upon a frame is often the groundwork of the embroidery. The art seems to have been invented in the East, and to have passed from the Persians to the Greeks, though the latter attributed its origin to Pallas Athene. The king of Pergamus is said first to have used gold thread, and the women of Sidon were renowned for their skill in the art. A familiar example of it is the sampler of a few generations ago, specimens of which are to be seen in most houses.

Embryo, in cormophytic plants the result, direct or indirect, of the fertilisation of the oosphere. In the lower liverworts (q.v.), such as *Riccia*, this cell, which when fertilised is known as the oospore, divides into octants, periclinal walls afterwards dividing off a peripheral cell-layer, and the whole interior becoming the spore-mother-cells of the sporogonium. In higher forms the basal half of the embryo forms a stalk, which may be expanded below into a "foot," by which the sporogonium or sporophyte generation keeps up a quasi-parasitic connection with the oophyte or previous (sexual) generation. The central part of the upper, or apical, half of the embryo may be non-sporogenous, forming a "columella," over which the sporogenous tissue is developed like a bell. In some of the lowest mosses the development is much the same; but, though the successive cell-divisions occur in a variety of ways, there is generally a distinct wall, columella, and bell-shaped or cylindrical sporogenous layer (archesporium). In the Pteridophyta the oospore gives rise not merely to a sporogonium or fruit-like appendage, but also to the whole leafy plant, and the embryo, whilst still within the cavity (venter) of the archegonium (q.v.), shows indications of a primary root, a leaf or "cotyledon," the apex of the stem or "plumule," and a foot. In ferns the embryo divides into octants, one of which forms the growing point of the stem, one at the other end the root, two others forming the cotyledon, and two the foot. In *Selaginella* (q.v.) and in almost all flowering-plants the upper half of the oospore goes to form a temporary chain of cells known as the *pro-embryo* or *suspensor*, the embryo arising from the lower half. In flowering plants the embryo has usually so far developed before the seed is ripe that cotyledons, plumule, and radicle are distinct; but some parasites, saprophytes, orchids, etc., have embryos, which remain rudimentary as mere undifferentiated masses of cells until after the dispersal of the seeds. In Gymnosperms the suspensor sometimes separates into parallel cell-chains, each terminated by an embryo, and more than one embryo may begin to develop in a single seed (polyembryony). In Angiosperms the two last cells of the suspensor contribute more or less to form the embryo, the development of which is very different in Monocotyledons from what it is among Dicotyledons. In the former there is generally one terminal cotyledon and a lateral plumule; in the latter, two

cotyledons, one on either side of the apex and a terminal plumule between them. In both cases the root is terminal, being produced at the attached or suspensor end of the embryo and growing out of micropyle (q.v.) in germination (q.v.). In the dicotyledonous embryo it is generally possible at an early stage to distinguish three primitive tissues—viz. an outer layer, the *dermatogen* or primitive epidermis; a central axis of elongated cells, the *plerome*, from which pith and fibro-vascular tissue originate; and, between them, the *periblem*, or primitive cortex. The embryo is nourished by the surrounding tissue of the oophyte in mosses and pteridophytes, *i.e.* the prothallus in the latter; but in Selaginella and in flowering-plants there are special nutritive tissues, the *perisperm* (q.v.) and *archisperm*, or *endosperm* (q.v.).

Embryology is that branch of biology which deals with the series of stages through which an animal or plant passes in its development from the primitive egg or ovum to the adult. The subject can be divided into two divisions, one dealing with the development of the entire animal, and the other with the development of the tissues of which the animal is composed. The former is known as ontogeny; as the latter is really only a branch of histology it will not be further noticed here. The subject is practically limited to the multicellular animals (Metazoa), as, though parts of the single cells of the Protozoa (q.v.) undergo certain modifications these do not mark definite stages of development, and therefore do not fall under the scope of embryology. Among the Metazoa the life cycles may be very clearly marked, or the transitions may be gradual and obscured in the parent. A metamorphosis such as that of the egg, caterpillar, chrysalis, and butterfly, is the best illustration of the former; the higher mammals, in which the young differ from the adult only in size and the imperfection of genital organs, are cases of the latter. The oviparous vertebrates, or those which lay eggs, afford the best facilities for the study of development, and it was upon the chicken that the first systematic observations were made by Galen, a Greek philosopher who lived from 130 to 200 A.D. He noted the successive stages in the development in the egg, but it was not until Harvey's discovery of the connection between the cicatricula of the yolk and the rudiments of the young bird that further important progress was effected. In the latter half of the 17th century Malphigi (1672), Vallisneri (1689), and Needham (1667), carried on Harvey's work, while in the 18th century Bichat, Wolf, etc., accumulated a considerable amount of information, which was first systematically arranged in the masterly series of memoirs by Von Baer (1820–1830). His discovery of the ovum in man and other mammals led to investigations upon the earlier stages of other vertebrates than the birds which had previously monopolised attention. His enunciation of his famous law that development proceeds from the generalised to the specialised gave the subject an important philosophic bearing, and his teaching that "developmental history is the best clue as to the affinities of an organism" stimulated research upon the embryology of the invertebrates. The way was thus prepared for the work of Johannes Müller on the development of the Echinoderms, and for Vaughan Thompson's demonstration that the Rosy Feather Star (*Antedon*) was a Crinoid and not a Starfish. It was not, however, till Kovalevski's work on Amphioxus and the Ascidians proved how fundamentally their structure and affinities had been misunderstood, that embryology really gained full recognition as one of the most important elements in classification.

Meanwhile a still keener interest had been roused by Darwin's demonstration of the truth of evolution, which showed that the higher animals had been evolved from the lower in a manner analogous to the life-history of an individual. It was therefore thought that embryology would give certain indications of the exact line of descent. This view was well expressed by its most uncompromising advocate, Haeckel, in the dictum "Ontogeny (*i.e.* the life-history of an individual) is a summary of phylogeny" (*i.e.* the history of the descent of a class). Stimulated by such interests, embryological investigations multiplied, and the rapid growth of information rendered possible the work of F. M. Balfour. Later results have led to a reaction by showing that though the theory expressed in Haeckel's maxim is right to a large extent, it is far from being absolutely true. They have shown that development is very complex, that it has been modified by many different factors, and that a short and abbreviated development is a great advantage both by securing economy of energy, and by reducing the period of dependence or weakness of mother and offspring. These have produced such great alterations in the embryological record that implicit reliance cannot be placed on it. For example, very closely allied animals, even different species of the same genus, may have very different life-histories. Thus *Hemiaster cavernosus* (an Echinoid) has a direct development (*i.e.* there is no metamorphosis, the young being born as Hemiasters), but in most of the species, such as *H. expergitus*, there is the usual metamorphosis, the young being born in the condition of *Plutei* (q.v.). Similarly most of the Lobsters and their allies pass at least through a *Zoœa* stage, but in some, such as *Astacus fluviatilis*, the common Crayfish, these stages are skipped. A still more remarkable case has been recently described by Brook, who has shown that by altering the conditions under which development proceeds, the same species can be produced along two very different lines. In such cases an unqualified acceptance of Haeckel's law would necessitate the assignment of the two sets of individuals to quite different groups. Haeckel admits such cases, and regards them as exceptional "falsifications of the embryological record," but these are now becoming so numerous that the law no longer receives the full confidence once placed in it.

Though the developmental history is generally complex and varied in the higher forms, there are certain general characters common to the development of all the multicellular animals or Metazoa.

All begin as a single simple ovum, which by repeated subdivision forms into a large number of similar cells. The process of development consists in the arrangement of these cells, and their modification to form the various tissues and glands of the body. The ovum is a typical cell, and consists of a small mass of protoplasm (q.v.) surrounded by a clear envelope. The nucleus (q.v.) is known as the germinal vesicle, and within it is the germinal spot (nucleolus); the germinal vesicle is composed of a coiled thread or "reticulum" separated by a more fluid material, the "enchylema;" the reticulum elongates, and becomes arranged in a series of spirals known as the "karyokinetic figures." [KARYOKINESIS.] The result of this process is that the nucleus divides into halves, one of which (the female pronucleus) is ejected from the body; this process is repeated, so that only a quarter of the original nucleus remains. The meaning of this "ejection of the polar bodies" is still unknown in spite of many guesses. The male element or spermatozoon undergoes similar preparation; when mature it usually consists of a small head (the nucleus) and a fine whip-like "tail." The spermatozoa obtain access to the ova either in the body of the female, as in most of the higher vertebrates, or after they are shed as in the frogs, starfish, etc. The head fuses with the nucleus of the ovum, and as the result of this stimulus, segmentation or repeated subdivision commences; growth takes place at the same time, and the result is a "morula," or mulberry-like mass, composed of many similar cells. The cells then arrange themselves in a single layer forming a hollow sphere or "planula." This then becomes two layers either by the cells at one end growing round those at the other (epibole), or by the in-pushing of the cells at one end (embole). A much rarer method is that by "immigration;" certain of the cells give off buds on the inner margin; these become separated and form an internal layer. This method is met with in some sponges and hydroids such as *Obelia*. Either process leads to a blastosphere (q.v.), and the absorption of some cells at one end forms a mouth, or blastopore. The lower Hydrozoa (q.v.) such as *Hydra*, or "the fresh-water polype," remain permanently in a condition which, generally speaking, is identical with this.

The next advance is the formation of an ingrowth around the mouth, and the sea-anemone is a good type of the animals which remain in this stage. The next advance is one of great importance; ingrowths occur at both ends of the body and meet in the middle to form a continuous tube. This is the archenteron, and develops into the alimentary canal; it is sharply marked off from the body cavity, which is the space that intervenes between the walls of this tube and the walls of the body. The presence of such a body cavity or cœlome is the characteristic feature of the Cœlomata (q.v.). The two layers of the blastosphere are known as the epiblast and hypoblast, the latter being the interior. In all the Cœlomata a third layer is formed between the other two, and is therefore called the mesoblast. The methods of its formation are varied and sometimes complex [MESOBLAST], but that by the immigration of "mesamœboids" or small amœboid cells formed from either or both of the other layers is very typical, and may be conveniently studied in embryo of the common starfish, which is one of the most convenient types for the earlier stages. The mesoblast usually grows until the whole of the original body cavity (or archicœle) is filled up, and a new body cavity is then formed by the excavation of spaces in the mesoblast, or by outgrowths from the primitive alimentary canal. [CŒLOME.] Each of the three layers gives rise to a definite series of organs or tissues; from the epiblast are developed the exoskeleton, such as shells, hairs, some horns, scales, etc.; the external glands such as the mammary glands, organs of respiration—including gills, lungs, and anal gills; the nerves, brain, sense organs, and pituitary body. From the hypoblast are developed the notochord, the alimentary canal, except the mouth and anus (which are epiblastic), parts of the excretory organs, and the internal respiratory passages, or tracheæ, etc., of invertebrates. From the mesoblast are developed the endoskeleton, the muscles, parts of the organs of excretion, and the generative organs.

Speaking generally, this description applies to any of the Metazoa, but there are numerous exceptions; for example, in *Peripatus* the ovum breaks up not into definite cells but into indefinite protoplasmic masses, which are not sharply marked off from one another; this is known as syncytial segmentation. As a rule these exceptions are on points of detail. Beyond this stage, however, it is not possible to give any account that will apply to all the phyla. The varied fate of the blastopore, which is, however, settled before this stage, illustrates the great differences that occur; thus it persists as the mouth in some worms, as the anus in *Patella*, as both in Peripatus, or it is lost entirely, or, as in insects, it is never formed. It is impossible in a general account to give any sketch of the types of development in each of the phyla of invertebrates; and cross reference should therefore be made to the articles on them and to those on the following invertebrate embryos, viz. Scyphistoma, Medusa, Pluteus, Nauplius, Zoœa, and Trochosphere.

The vertebrate group, however, requires special mention—especially in regard to the methods by which the embryo gets its food. The primitive ovum of all animals has its store of food either irregularly scattered through the ovum (alecithal), collected at the centre (centrolecithal), or at one end (telolecithal). In some vertebrates sufficient food or yolk is stored up in the egg, as with the birds, but in others the embryo has to obtain its nourishment from the parent; in those which are oviparous (*i.e.* lay eggs) the eggs may have an abundant food supply as in the case of birds, or the ova may be small and numerous: in the latter case development is rapid, and there is often a metamorphosis as with the frogs. In the case of those animals which develop somewhat slowly, some special arrangement is necessary for the nutrition and respiration of the embryo. This is secured by the development of two additional membranes, the

amnion and allantois, which occur in reptiles, birds, and mammals—three classes consequently associated as the Amniota. The allantois was originally simply respiratory in function; in eggs it spreads over the inner surface of the shell, through the interstices of which sufficient air is able to penetrate. In all the mammals, except the egg-bearing monotremes, however, the allantois cannot be respiratory; it comes into contact with the wall of the uterus and splits up at the end into a number of processes, each of which fits into a depression known as "uterine crypt." By this the allantois becomes so intimately connected with the parent that the blood of the latter is able to penetrate by osmosis to the blood-vessels of the embyro; this is thereby nourished and the necessity for a special respiration of its own obviated. The yolkless yolk sac by which the embryo was originally attached to the parent undergoes reduction with the gradual increase in the importance of the allantois until it remains only as the rudimentary blastodermic vesicle.

Another point of great importance in the vertebrates is the origin of the central nervous system, which it has already been pointed out is epiblastic. A slight depression forms along the dorsal side of the embryo, and by the meeting of the margins above as this deepens the furrow is converted into a tube; this is thus lined entirely by the external layer, and from it the central nervous system is developed.

In regard to the relations between embryology and phylogeny there is one warning that may well be emphasised, and that is the necessity for distinguishing between primary characters and those which have been secondarily acquired. It is the former only which have any value on the phylogeny of the group. For example, the most familiar type of Echinoderm larva is the *Pluteus*, so named from the easel-like arrangement of the rods which support the ciliated arms; there can be little doubt that this arrangement is an adaptation to allow the larva to swim about. There is no reason to believe that the *Pluteus* was ever the adult form of any ancestor of the Echinoids. The impossibility of determining which characters are primary and which secondary is that which renders the embryological record as imperfect as that of palæontology. [HEREDITY.]

Emden, a town of Prussia, in the kingdom of Hanover, on the right bank of the Ems (q.v.), near the entry of that river into the Dollart See. The streets are wide and well-paved, and the solid red-brick houses and the abundance of canals that intersect the town give it a Hollandish appearance. The Hofkirche dates from the 15th century, and has a lofty tower, as has the Stadthaus. The roadstead admits large vessels at all times, but the port—consisting of an outer and two inner harbours—is dependent upon the tide. The chief industries are shipbuilding, brewing, distilling, and the manufacture of leather, hosiery, tobacco, and soap. The chief exports are grain, dairy produce, gin, hides, tallow, and wool; and hemp, timber, potash, wine, and colonial produce are imported.

Em-egedesen, the people of the Agades uplands, Central Sahara, who are of mixed Berber (Tuareg) and Sourhay (Negro) descent. The Emegedesiye language is a Sourhay dialect identical with that still current in Timbuktu and surrounding districts. [SOURHAY.] But the Haussa and Berber languages are also spoken in Agades (H. Barth, *Travels*, vol. i. *passim*).

Emerald, the precious form of beryl (q.v.), having a fine green colour. As a gem it ranks after the sapphire and diamond in value. It has been successfully imitated in paste, the natural colouring matter, chromium-sesquioxide, being employed. The finest specimens come from Muzo, in New Granada, where they occur in a fossiliferous limestone. The *oriental emerald* is the very rare green variety of the sapphire.

Emerald Green, a fine green pigment consisting of a mixture of arsenite and acetate of copper, and hence of a poisonous character.

Emerson, RALPH WALDO, essayist and poet, was born at Boston, in the United States, May 25, 1803. He came of a high Puritan lineage, and his family was one of the oldest in America, his ancestors having gone out from Gloucestershire in 1635. Emerson's father was a Boston clergyman, and worthily continued the traditions of a long line of able Protestant ministers. Ralph Waldo was the third of seven children, and when but six years of age he had the misfortune to lose his father, who left his family in a straitened condition. To his mother and his aunt—both women of a superior order of intellect—the future philosopher was indebted for his early training. At eight years of age he entered the public grammar school, and shortly afterwards the Latin school. He gave a scholastic promise which was scarcely fulfilled, for at eleven he was a close student of Greek, and could turn Virgil into English heroic verse. He entered Harvard University, where he graduated in 1821, not, however, taking a distinguished rank; but he carried off a second prize for an essay in English, and was chosen class poet. After some experience as a schoolmaster, during which he studied theology under Dr. Channing at the Harvard Divinity School, he was ordained to the Unitarian ministry. In March, 1829, he became the colleague of the Rev. Henry Ware, minister of the Second Church in Boston. In the ensuing September he married Miss Ellen Louisa Tucker, who died without leaving any children in 1832. During this same year Emerson preached a sermon on the Lord's Supper which gave umbrage to his congregation. Notwithstanding the influence of Channing, he felt impelled to resign his charge, although he preached occasionally for some three years longer. Emerson visited Europe in 1833, and after a brief sojourn in France and Italy came to England, where he made the acquaintance of Coleridge, Wordsworth, and Carlyle. He was especially drawn towards Carlyle, and the seer of Craigenputtock and Emerson himself have left vivid descriptions of their meeting and of their conversations. On his return, Emerson settled at Concord (Massachusetts), and began to write

essays and to deliver lectures, chiefly on biographical subjects, in Boston and elsewhere. His first home at Concord was an old gambrel-roofed house built by his grandfather, and celebrated as the "Old Manse" of Hawthorne's story. In 1835 he married Miss Lydia Jackson, of Plymouth, Massachusetts, with whom he entered upon the new home where he peacefully remained for the rest of his long life. Emerson had begun a correspondence with Carlyle in 1834, and this correspondence continued for nearly 40 years. The deaths of his brothers Charles and Edward—young men of brilliant promise—exercised a profound impression upon Emerson, who sought relief in composition, and in gardening and other occupations of a retired country life. In 1836 he founded the Transcendental Club, and published anonymously his little work *Nature*, which dealt with such subjects as beauty, commodity, language, discipline, idealism, spirit, and prospects. The authorship of the book was at once recognised, but its sale was very small, only reaching 500 copies in twelve years. *The American Scholar*, an oration delivered before the Phi Beta Kappa Society of Harvard, marked an event in the literary annals of the United States, and it has been described as the "American intellectual declaration of independence." Emerson's *Address before the Senior Class in Divinity College, Cambridge, July, 1838*, caused a lively sensation in the religious world, and particularly among the Unitarians. The orator's position was extremely heterodox, and it was severely attacked by (among others) Professor Andrews Norton in an article entitled *The Latest Form of Infidelity*. The eight years from 1838 to 1846 were years of somewhat prolific production with Emerson, the following works appearing in the order named—*Ethics*, 1838; *The Method of Nature*, 1841; *Man the Reformer*, 1841; *Lectures on the Times*, 1841; *Essays*, 1842; *Essays*, 1844; and *Poems*, 1846. When Margaret Fuller and other Transcendentalists founded the *Dial*, Emerson became one of its contributors, and wrote for it regularly during its chequered existence of four years. He also took a tolerant, if slightly humorous, interest in the socialistic experiment at Brook Farm, sympathising to a considerable extent with the cultured but unpractical colonists. Emerson visited England again in 1847, and lectured in London, Manchester, Liverpool, and other towns. In the ensuing year he went over to Paris with Arthur H. Clough and W. E. Forster. On his return to America in 1849 he published one of his best-known works, *Representative Men*. These critical and biographical essays contained much of his finest writing. The author, after treating of the uses of great men, proceeded to discuss, with imaginative fervour and true philosophical insight, Plato the Philosopher, Swedenborg the Mystic, Montaigne the Sceptic, Shakespeare the Poet, Napoleon the Man of the World, and Goethe the Writer. These literary appreciations still retain their popularity. In 1852 Emerson published the *Memoirs* of his friend Margaret Fuller, Marchesa d' Ossoli, author of *Woman in the Nineteenth Century*, and other works. Another of his most popular works, *English Traits*, appeared in 1856. In this volume he recorded his thoughts while visiting England and Scotland, and his sketches of life and character in the old country were very fresh and original. When describing his first visit to England he gave vivid reminiscences of Coleridge, Landor, Wordsworth, Carlyle, and other distinguished men. *The Conduct of Life*, another volume of papers partly philosophical and partly practical, was issued in 1860. Soon after the publication of this volume the American Civil War broke out. Emerson, like all Northerners, had a great detestation of slavery. He both wrote and spoke against it, and was a warm admirer of John Brown, of Harper's Ferry celebrity. He was an Abolitionist of the Free Soil party, and would have bought out the slave-holders. He admired the great self-sacrifices made in the interests of national union and for the abolition of slavery, and hailed warmly the manifestation of the national spirit at the close of the war. His own influence began to increase at this time. In 1867 he published his *May Day, and Other Pieces;* in 1870 *Society and Solitude;* and in 1871 *Essays*, and a volume entitled *Parnassus; Selected Poems*. Emerson's house was destroyed by fire in 1872, and during its rebuilding he paid a third visit to England and the Continent, remaining in Europe for about a year. After his return to the United States his mind never regained its early elasticity, and he suffered from frequent loss of memory; but he still returned at intervals to his literary studies, and in 1876 published his *Letters and Social Aims*. His closing years were marked by a calm serenity, and his death, which was very peaceful, occurred at Concord on April 27, 1882. In religion Emerson was a rationalist and an individualist, and in philosophy an idealist. All through life he was a courageous optimist, ever aspiring to find a wise and happy solution for the great problems of life. In nature and humanity he perceived ennobling influences for the elevation of the race and of the individual. He was possessed of an excellent sense of humour and a good judgment, and as yet America has produced no greater essayist or more original thinker. His poems are quaint and beautiful, but frequently irregular in form. A collected American edition of Emerson's works has been published in 11 volumes, and an English edition in 6 volumes. His correspondence with Carlyle has been ably edited by Professor Charles Eliot Norton, and an authoritative *Life of Emerson* has been written by James Elliot Cabot, the editor of his collected works.

Emery, an impure variety of corundum (q.v.) or sapphire, containing 60 to 80 per cent. of alumina and 8 to 33 per cent. of iron-oxide. It is grey or brown, sub-opaque and amorphous, with a hardness of 9 and specific gravity of 3·7 to 4·3. It occurs in schists, gneiss, and metamorphosed limestone, and in large boulders in a red soil, in Naxos and other islands in the Grecian Archipelago, and at several localities in Asia Minor, whence in all from 5,000 to 7,000 tons are obtained annually. It is packed in casks containing 4 to 5 cwts. each. After being crushed and sifted, it is either concreted into grinding wheels or hones, or stuck on to paper or

cloth, and is used for polishing plate-glass, crystals, and metals, and for cutting granites. Emery-wheels are made up of a mixture of emery-powder and vulcanised indiarubber; they are used extensively for smoothing and polishing iron-castings and for sharpening tools.

Emetics (Gk. *ěmeo*, I vomit), substances which produce vomiting, employed in medicine to get rid of some irritating or poisonous substance which has been taken into the stomach, and they are sometimes administered in cases of laryngeal obstruction (the act of vomiting promoting the expulsion of material blocking up the air passages). Substances given with the object of putting a stop to excessive vomiting are called *anti-emetics*. One of the simplest methods of producing vomiting is to irritate the fauces with a feather; warm water, mustard and water, brine and alum are reputed to possess emetic properties, but their action is very unreliable. The emetics upon which reliance is generally placed are such drugs as sulphate of zinc, ipecacuanha, antimony and apomorphia. Their action is apt to be attended with alarming symptoms, and they should never be administered save under medical advice.

Emigrés, a word generally used to designate those French royalists who quitted France at the Revolution of the last century, and took refuge in other European countries, where they supported themselves by teaching French, or other similar pursuits, and in many cases settled finally in their adopted country. Napoleon when Emperor gave permission for most of the exiles to return. The name is also sometimes applied to the Huguenot and other religious refugees.

Emir (also written *Ameer*), an Eastern word denoting "noble" or "princely," and originally employed to denote those who could claim descent from Mahomet or his daughter Fatima. Such emirs are to be found in Arabia, and in Turkey. They are entitled to wear a green turban, and form a kind of privileged nobility. Another use of the word is to denote the holders of certain high offices, and the Caliph himself is the Emir or Commander of the Faithful.

Emission Theory of Light, known also as the corpuscular theory, was that light consisted of extremely refined particles of material nature projected from the luminous body. If it struck certain substances it rebounded without entering; those were called opaque substances. If, on the other hand, the material was transparent, it possessed the property of allowing the light corpuscles to enter. The distinguished advocacy of Newton retarded the death of this theory and the advance of the true wave-theory of light. He explained the ordinary laws of reflection and refraction, certain phenomena of interference of light, and other observed effects, by the most ingenious assumptions of properties possessed by the light particles; but Fresnel and others by repeated experiments in diffraction and like branches of the subject cleared away the difficulties that had presented themselves to the wave-theory, and this century has seen the complete adoption of the latter.

Emmet, Robert (1783–1803), was an enthusiastic Irish patriot of estimable qualities but unfortunate life. He was born in Cork, and studied for the bar at Trinity College, Dublin, but was expelled for his political views. Falling under the suspicions of the Government, he left Ireland during the suspension of the Habeas Corpus Act, but afterwards returned, and became a member of the Society of United Irishmen. For his share in the rebellion of 1803 he was arrested, tried, condemned, and executed. His attachment to Miss Sarah Curran caused much embarrassment to Curran (q.v.), and gave occasion for Tom Moore's ballad, *She is far from the land where her young hero sleeps.*

Emotions, in *Psychology*, one of the three great classes of mental states. An emotion is analysable into a set of feelings (pleasant, painful, or neutral) combined with presentations, popularly called ideas. The feelings impel action towards or away from the objects these represent, so that emotion is (in the developed mind) the link between thought and volition. Emotions are thus motives to action, and it is in proportion to his habit of subordinating his emotion to the regulative faculty that a man ranks higher or lower in the scale of reasonable beings. By their physical effects the emotions are classed as pleasurable or painful.

Empedocles, a Greek philosopher and poet, born in Sicily in 460 B.C. He was greatly reverenced by his fellow-citizens, who wished to make him king, but were persuaded by him to adopt a democracy. He was looked on as a prophet, a magician, and the apostle of liberty, and his life was rendered more interesting by the manner of his death, since tradition represented him to have fallen into the crater of Mount Ætna. As a philosopher he held almost Pythagorean views, taking as the foundation of existence the four elements—earth, air, fire, and water—and the antagonistic principles of love and hatred. His philosophic views were embodied in vigorous verse, in a style imitated at a later period by the Latin Lucretius.

Emperor, the highest rank among sovereigns, the name being derived from the Latin *imperator*, which has in German been rendered as *Kaiser*, in Russian *Czar*, from the subordinate Latin title *Cæsar*. The word, which strictly meant holder of the supreme power, was bestowed, under the republic, as a title upon victorious generals. After the fall of the republic the name was applied to the supreme ruler, and eventually became his most usual title. It was especially associated with military power. It was lost in the West, though long retained in the Byzantine empire, but was revived at the restoration under Charles the Great of the Holy Roman Empire. The Emperor then had theoretically the same ascendency politically as the Pope spiritually—an ascendency often disputed, and never fully admitted. Napoleon adopted the title of Emperor in this sense of ascendency, and the German Empire of the present day involves the same fundamental idea, as does also the Queen of England's title of Empress of India, and the expression "Imperial Parliament."

Emperor Moth (or *Saturnia carpini*), a large moth interesting as the only British representative of the *Saturniidæ*, the family which includes many of the best-known of the silkworms and the great Atlas moths. The English species has large brown fore wings which measure more than two inches in expanse: the hind wings are yellow. The larva, which is green dotted with pinkish spots, is most commonly found on heaths.

Emphysema, a term applied to an unnatural accumulation of air in some tissue of the body. In wounds of the chest wall, where the lung is injured and air escapes into the textures surrounding the damaged parts, a condition which is spoken of as surgical emphysema is produced. Emphysema proper is a peculiar affection of the lungs in which the air cells become dilated. On examination of an emphysematous lung a number of blebs are seen to project from its surface, and on throwing the diseased organ into water it is found to possess an unnatural buoyancy due to the distension of its vesicles with air. Emphysema is very apt to occur in association with repeated attacks of bronchitis; indeed, in this connection, it is one of the commonest diseases met with in persons beyond middle age. The symptoms produced by the condition are shortness of breath, duskiness of the skin due to deficient aëration of the blood, and often some degree of emaciation. Long-standing emphysema usually affects the heart by interfering with the circulation of blood through the lungs. The treatment of emphysema mainly resolves itself into dealing with the associated bronchitis; taking every precaution against cold, careful dieting, and in some cases removing the patient to favourable atmospheric surroundings.

Empirical Formulæ, formulæ which simply express the chemical composition of a substance without any attempt to indicate the mode in which the atoms are united in the molecule—*e.g.* alcohol C_2H_6O, glycerine $C_3H_8O_3$, etc.

Empiricism, in *Philosophy*, a general term for systems based on the doctrine that all knowledge is ultimately derived from experience (Gk. *empeiria*), without any innate element. The name is often used in medical science as a term of reproach almost synonymous with *quack*, though strictly speaking all medical and surgical science is empiric and is valuable just in so far as it is founded upon observation and experience. But the medical empiric (a "bone-setter" is a good example) usually knows only a limited set of facts, but not the principles discovered by past experience.

Empyema, a collection of pus or matter in the pleural cavity. Inflammation of the pleural membrane [PLEURISY] is at times attended by the pouring out of fluid (pleurisy with effusion), such fluid may be serous or purulent. In the latter case the condition is said to be one of empyema. When matter forms in this way within the chest it is, as a rule, hopeless to expect a cure unless an exit is afforded for the pent up pus. Sometimes the matter bursts into one of the air tubes, and is discharged by the mouth, more commonly it finds its way through the chest wall. The aim of the physician is to secure the evacuation of any collection of matter which may form at the earliest opportunity, and not to subject the patient to the tedious and exhausting process which is implied if the pus be allowed to find its own way to the surface. Inflammatory affections of the pleura in children are particularly apt to result in empyema. Treatment consists in removing matter by means of an aspirator, or in making a free opening, under antiseptic precautions, through which the pus may discharge.

Ems. 1. A river of Germany, rising in the S.E. of the Teutoburger Wald in Lippe Detmold; it flows N.W. through Rhenish Prussia and through the W. of Hanover, falling into the Dollart See near Emden. It has a course of 234 miles, and is navigable on the tide for 13 miles to vessels of 200 tons. A canal unites it to the Lippe and so to the Rhine.

2. A Prussian town of Hesse-Nassau, on the Lahn, and a well-known watering-place from the 16th century onwards. The water is warm—from 70° to 118° Fah.—and saline, and is considered beneficial in cases of catarrh and gout, and in affections of the lungs, stomach, or kidneys. It is highly charged with carbonic acid. The annual visitors average 8,000, and much water is bottled for export. Here took place the memorable interview between the King of Prussia and Benedetti in 1870.

Emu, any bird of either of the two species of the Ratite genus *Dromæus*, confined to Australia. They belong to the same family as the Cassowary (q.v.), from which they differ in having no casque, or wattles; the head and the neck are feathered, and the toes furnished with stout-curved nails. The wings are rudimentary, but their powerful legs enable these birds to run with great speed. The height is about six feet, and the plumage shades of dull brown, the lightest hues being beneath. The common emu (*D. novæ-hollandiæ*) is widely distributed over the whole of Australia, and is much hunted for its flesh, which is said to resemble beef, and this fact and the fondness of the natives for its eggs have greatly reduced its numbers. The Spotted Emu (*D. ironatris*) is confined to Western Australia, and has been partially domesticated in Surrey, breeding readily in confinement. In both the species true pairing occurs.

Emulsin, a substance occurring in sweet and bitter almonds. It possesses the power of acting as a hydrolytic agent, causing the decomposition of the *amygdaline*: also present in grape sugar, prussic acid, and benzaldehyde. [BITTER ALMOND OIL.]

Emys, a genus of Marsh Tortoises, with 64 species, chiefly Oriental and American. *E. europæa* is the Common Marsh Tortoise of Southern Europe, North Africa, and Western Asia.

Enamel. [TOOTH.]

Enamels are vitreous coatings applied to the surface of pottery or metals, though the name is sometimes restricted to the latter case only. The

vitreous coating is generally an easily fusible glass—often a lead glass—containing oxide of tin, or other substance, to render it opaque. In the case of enamelled culinary articles, lead glass is unsuitable, and should never be used, a potash or soda glass being best employed. Coloured glasses are obtained by the addition of different metallic oxides. When obtained the glasses are finely powdered, spread over the surface to be enamelled, and fused on. In the case of pottery the fusion takes place easily, but the enamelling of metals is not so readily accomplished. Enamels are chiefly employed for ornamental and artistic purposes, and also as a protection for metals, to prevent them oxidising, etc. Thus for the latter purpose they are largely used as a coating for the interior of saucepans and kitchen articles, baths, sheet iron for advertising purposes, etc. Enamelling for ornaments is an art of great antiquity, and examples have been found from the prehistoric ages, while it is known to have been practised by the Egyptians and Assyrians several centuries B.C. The analysis of coloured enamels of these times has also shown that they used the same substances for colouring the glasses as are now generally employed. Examples of Roman enamelled work are existent, but the art attained to its greatest popularity in the Middle Ages. Various modes of ornamentation were employed, as *Champ Levé*, much practised at Limoges, which from the 12th to the 14th centuries was the chief seat of the art. In this the pattern was engraved on a sheet of metal, the parts to be enamelled being hollowed out, and the hollows filled with the enamel, fused, and afterwards ground and polished. *Cloisonné*, the style of the Byzantine school, which flourished during the 10th century. The design is traced by thin bands of metals, frequently gold, fixed to the metallic base, the space between the bands being filled with the enamel. This method is also much employed at the present time in Chinese and Japanese ornamentation. During the 13th century translucent enamels were largely used, chiefly in Italy. The design was engraved on the metal, usually silver or gold, and the enamel applied so that its varying thickness produced the shades necessary. Afterwards enamels were largely employed for the purpose of surface painting. In the earliest style, Limoges, 16th century, the metal was covered with a dark enamel, upon which the painting was done in light colours. In the latter style, which flourished much in England and Paris, a white opaque enamel was laid upon the plate, and the painting was executed in coloured enamels mixed in a suitable medium, each colour being separately fused. This was very popular during the last century for miniature trinkets, watch-cases, snuff-boxes, and other small articles, though in England larger works were often done in enamel.

Encephalocele (from two Greek words signifying a brain tumour), a condition of rare occurrence in young infants, in whom a protrusion of the cranial contents takes place through some imperfection in the limiting walls of the skull.

Enchondroma, a tumour consisting of an abnormal cartilaginous outgrowth. [TUMOUR.]

Encina, JUAN DEL (1468–1534), a Spanish dramatist, born at Salamanca or at Encinas. He was educated at Salamanca, and then went to Madrid, where he entered the household of the Duke of Alva. In 1492 he began to write comedies, and in 1496 published some dramatic and lyric poems. He went to Rome, and took orders, and became *maestro di capella* to Leo X. A farce published by him in 1514 is lost. In 1519 he went to Jerusalem, and published a verse account of his journey. He soon after returned to Spain, as Prior of Leon, and died at Salamanca. The poems mentioned above are an interesting link between the old Mystery Plays and the later drama.

Encke, JOHANN FRANZ (1791–1865), a German astronomer, was born at Hamburg. He studied under the astronomer Gauss at Göttingen, and during the War of Liberation served in the artillery from 1813 to 1815. He was then appointed assistant in the observatory at Seeburg, and here it was that he calculated the orbit of the comet now bearing his name, predicted the times of its reappearance, and discovered an acceleration in its motion. In 1825 he became director of the observatory at Berlin, a post which he retained till death. Besides many papers in astronomical transactions, he wrote in 1822 *Die Entfernung der Sonne*, and in 1823 *Der Venus-Durchgang von 1769*.

Encyclical, a term used to denote a circular letter addressed by a religious superior to those in his charge. The name is now generally restricted to a letter issued by the Pope to the Bishops of the Roman Church, and embodying the Papal opinion or decision upon some point of faith, morals, or discipline. It is a favourite instrument of the present Pope (Leo XIII.), just as the Allocution was the instrument preferred by the late Pope Pius IX.

Encyclopædia, a barbarous Greek compound, denoting originally, according to its etymology, the circle or round of knowledge that constituted an ordinary liberal education. Later the name came to be employed to a kind of compendium of general knowledge, or of the special knowledge existing of any particular branch or subject. The *Summa Theologica* of St. Thomas Aquinas is an example of the second kind of encyclopædia, while the earliest general work of the kind was the *Speculum Historiale, Naturale, Doctrinale, Morale*, begun and almost finished by a Dominican monk, Vincent of Beauvais. Francis Bacon designed a scientific encyclopædia in his *Novum Organum*, and there have been many since, both general and special, among which may be mentioned the *Encyclopædia Britannica*, with its nine editions; the *Encyclopædia Metropolitana*, in which S. T. Coleridge wrote upon *Method*, and Whately wrote the articles on *Logic* and *Rhetoric*; and Larousse's *Dictionnaire*.

Endemic (derived from two Greek words, *en*, in; *demos*, a people), a term applied to diseases which are definitely associated with particular peoples or particular localities. The word is used in contrast to the word epidemic, the latter being applied to those diseases which spread widely

and are not confined within narrow geographical limits. The best example of an endemic disorder is afforded by malaria or ague, this disease displaying, as a rule, a partiality for those living in particular situations, such as the marsh lands in the tropics, the deltas of rivers, and the like.

Endive (*Cichorium Endivia*), a hardy annual plant belonging to the *Compositæ* and closely related to the Chicory (q.v.). It is indigenous in North China; was used as an esculent by the Egyptians at an early period; is mentioned by Ovid and Pliny as being so employed by the Romans; and was cultivated in England in 1548. It produces a cluster of large, sinuate, smooth-toothed leaves, either broad and slightly torn as in the Batavian variety (*C. E. latifolia*), or narrow and finely curled as in the variety *crispa*. The leaves are bleached either by being tied up or by being covered by a pot to reduce their bitterness of taste, and are then used in salads and stews. The flower-stalk grows two feet in height, and bears heads of pale blue ligulate florets. Endive may be sown, under glass, in January; or, in the open, from April to August, the plants being thinned, planted out when a month old, and bleached for 10 to 30 days before gathering.

Endocarp, the inner layer of the fruit, most correctly applied to such cases as the "stone" of the drupe, as in the cherry, plum, peach, etc., or the "shell" in the cocoa-nut, where there are three distinct layers all formed from the carpels or true gynœcial structures and not from the floral receptacle. The three layers are the *epicarp*, *mesocarp*, and *endocarp*, and are known collectively as the *pericarp*.

Endoceratidæ, an extinct family of Cephalopoda, including *Endoceras*, a genus remarkable as the siphuncle (q.v.) is protected by a thick tube formed by the septa being prolonged backwards around it. *Endoceras* is found only in the Lower Silurian (Ordovician), except one doubtful species, but its ally *Piloceras* also occurs in the Cambrian.

Endochrome, a term once used for the protoplasm and other contents of the plant-cell, especially when coloured by chlorophyll or other colouring-matter. It is now practically confined to those plates of protoplasm in diatoms (q.v.) which are coloured brown by diatomin.

Endodermis, or BUNDLE-SHEATH, a layer of cells outside the fibro-vascular tissue of the stem or root of some plants, commonly containing starch-grains.

Endogamy. [MARRIAGE.]

Endogens, a name formerly applied to Monocotyledons (q.v.) from the erroneous notion that in this class of flowering plants the growth in thickness of the stem was *endogenous*, or from without inwards, in contradistinction to that of Exogens (q.v.). The origin of roots is correctly termed endogenous, since they are formed internally and force their way out through the outer layers of tissue.

Endoparasites are parasites which live within the body of the host, such as the tapeworm within a dog. A second group of parasites, including the fleas and ticks, live on the surface of the host, hidden in its fur, etc.; such are known as ecto-parasites.

Endophagy. [CANNIBALISM.]

Endoplasm, the more granular inner portion of the protoplasm of the plant-cell, in which the chlorophyll-granules are suspended. In the rotatory movement of the protoplasm, such as is seen in *Elodea* or *Vallisneria*, this layer alone moves.

Endoplast is the term now generally employed for that part of a cell previously known as the nucleus.

Endosmose, in *Physics*, signifies the passage of a fluid through a membrane or other porous partition, there being another fluid on the other side. This is illustrated by the endosmometer, which consists of a glass tube at one end of which a membranous bag is fixed. If the bag be then filled with milk and immersed in a vessel of water it will be found that the liquid within the instrument gradually rises to fill the tube, and the water-level outside gets lower. This is due to a process of diffusion of each liquid through the membrane; but more water passes in than milk passes out, and there is a resultant rise of level inside. The inward flow to higher level is called *endosmose*, and the smaller outflow to lower level is called *exosmose*. For the action to take place it is necessary that the liquids should be capable of mixing, that they should be of different densities, and that the membrane should permit at least one of the liquids to flow through. The rate of diffusion depends on the substance in solution, on the strength of the solution, and on its temperature. A similar piece of apparatus, with a porous earthenware jar instead of the membrane, may be used to exhibit similar effects with gases. [DIFFUSION, OSMOSE.]

Endosperm, a term applied to tissues within the seed of flowering plants, or in the macrospore of Selaginella (q.v.), which in all cases serve to nourish the embryo; but which are probably not of homologous origin, so that the term is somewhat ambiguous or not morphologically precise. In Selaginella it is a large-celled tissue formed by free cell-formation below the diaphragm at the base of the prothallium, and it has been termed the secondary prothallium or metasperm. In Gymnosperms it is similarly formed within the embryo sac (whence its name), but before fertilisation, the archegonia being formed on it, so that it is apparently a primary prothallium or archisperm. In Angiosperms it does not originate until after fertilisation, when the secondary nucleus of the embryo sac undergoes repeated division, and so forms this tissue, which seems here, as in Selaginella, to be a metasperm. None is formed in orchids, and but little in Alismaceæ. In many seeds it is absorbed by the embryo before the seed is ripe (exalbuminous); but in others, including most monocotyledons, it remains (albuminous), and is only absorbed during germination. [ALBUMEN.]

Endostyle, the term given to the cartilaginous rod of *Amphioxus* (q.v.), and the thin line along the ventral side of the branchial cavity of the Ascidians (q.v.). It is regarded as the representative of the vertebral column of the vertebrates or the cartilaginous notochord of the other Chordata (q.v.).

Endymion, according to one legend, a Greek shepherd who was beloved by Selene (the Moon), who put him to sleep on Mount Latmos in order to enjoy his company. His sleep is also said to have been inflicted by Zeus as a punishment for falling in love with Here, or in answer to his prayer for eternal youth. The legend forms the subject of Keats' charming poem, *Endymion*.

Enema, or CLYSTER. Drugs and nutrient material are sometimes administered by injecting them into the lower bowel. Such an injection is termed an *enema* (from a Greek word signifying to inject). A simple enema prescribed with the object of emptying the lower bowel in constipation usually consists of warm water, or soap-and-water, with the addition sometimes of castor oil. Nutrient enemata are given where food cannot be retained when administered by the mouth; or where, as in stricture of the œsophagus, there is a difficulty in swallowing, and consequently in the passage of nutrient material from the mouth into the stomach.

Energumen, one possessed by an evil spirit. [DEMONOLOGY.]

Energy does not admit of a very satisfactory definition. It is usual to regard it as that property possessed by material bodies in virtue of their position or of their motion, by which resistance may be overcome. Energy of position is called *potential;* energy of motion is called *kinetic;* and all manifestations of energy may without great assumptions be classified as potential or kinetic. Taking a simple example of energy due to motion, a cannon-ball of mass m travelling with speed v, possesses an amount of kinetic energy that will enable it to perhaps penetrate a solid screen of iron or wood. It certainly presents a case of motion against resistance, for which energy is required. To measure its energy the simplest plan is to regard it as being given to the ball by a definite force acting on it for a definite distance. The energy necessary to do this is measured by the product of the force and distance; a small force would require a great distance, and conversely. Newton's laws of motion help in working this out, and give us the result $\frac{1}{2}mv^2$ as a measure of the energy due to the motion of the ball. Suppose this ball to be projected up vertically, in direct opposition to the force of gravitation on it. Then it is again effecting a motion against resistance, and because its supply of energy is insufficient its speed will, after a time, become zero, and the ball remain for a moment motionless. It has in this position no energy of motion, but being so placed in relation to the earth that it may be attracted and put in motion, it is said to have potential. This is also measured by the amount of work done in bringing it to that position; if h is the height it reaches and w its weight, then wh measures its potential energy. If it is now allowed to fall, the force w acting through the distance h gives just so much kinetic energy ($\frac{1}{2}mv^2$) to the body as it lost previously in rising through the same height against the same force. Both forms of energy may be expressed in the same units, because they are convertible the one to the other. The ordinary engineer's unit of energy or of work is the *foot-pound*, which is the amount of energy required to exert a force of 1 lb. weight through a distance of 1 foot.

The principle of *conservation of energy*, applicable to all its modifications of kinetic or potential, states that in any given system the amount of energy must remain constant unless it gives or takes from external systems. There may be transformations from one form to another in the system, but no change in total quantity. Any expenditure of energy to produce motion against resistance—*i.e.* to do work—merely means therefore a redistribution of energy, and work may be defined as the transformation of a certain amount of energy.

Certain motions exhibiting kinetic energy, or arrangements exhibiting potential, are obvious to the sight because of their appreciable magnitude; thus we have—

(*a*) *Visible kinetic energy*, as of a cannon-ball in motion, or of a spinning-top.

(*b*) *Potential energy of visible arrangement*, as of the cannon-ball at its highest point, a coiled-up spring, or of an elevated cistern of water, each of these being able to "run-down" to a lower potential, and do work in the process.

(*c*) Alternations of the above two forms, as of a swinging pendulum, or a vibrating rod such as a tuning-fork. Then there are other forms of energy which manifest themselves in much smaller linear dimensions, though perhaps they are as readily obvious to the senses.

(*d*) The alternating energy of a *hot body*. Such a body is understood to have its molecules in some sort of oscillatory motion; this, therefore, corresponds with *c*.

(*e*) The alternating energy of *radiation*. This is possessed and transmitted not by material particles, but by the ether; and it is here that exception might be taken to the definition of energy given at the beginning of the article, which stated that it was a property possessed by material bodies. But though ether is not material in the ordinary sense, yet it is regarded as possessing one property characteristic of matter; it is believed to have *mass*, and any alternating motion in ether implies its possession of a certain amount of energy.

Radiation probably includes all forms of energy that are transmissible through ether. Thus, radiant heat and light come under this head; also electromagnetic radiation, which differs only in degree and not in kind from the other two. The energy of electricity in motion along a conductor may consist of energy of radiation, and of an alternating energy of material particles. [HYSTERESIS.] If the conductor has any resistance, part goes to heat.

(*f*) *Potential energy of separation.* This is analogous to *b*, but is intended here to represent molecular separation. Two particles may have an affinity for each other—*i.e.* a tendency to combine

and lower their potential energy. Work has to be done to separate them, whether their attraction for each other is due to the existence of opposite electrical charges on each, or to the doubtless similar chemical affinity of one for the other. In fact, this applies to all cases where separation causes strain in the system.

These different forms of energy are thus all cases of potential or kinetic; it is conceivable that even this division may be avoided, and that potential energy may be shown to be energy of motion, or that kinetic energy is energy of position.

A steam-engine offers a good instance of transformation of energy. Coal and oxygen uncombined possess a store of potential, though in contact they may not at once unite, just as a loose stone may be kept high up on a mountain without approaching the earth more nearly. But as in the latter case the energy of a little push may start the change of energy of the loose stone, so with the coal the energy of a little heat at high temperature may start its change. The burning coal gives heat energy, and this is more or less efficiently applied to heat water in the boiler of the engine. The water is converted into steam, and this, possessed of energy derived from the coal, is able in the steam-cylinder to produce motion against resistance. A piston receives a reciprocating motion, and transfers the energy to the rotating parts of the engine. If the engine is a locomotive, its energy of mechanical motion will drive a train along a railroad at a definite rate, again overcoming resistance due to air, friction, etc. The speed of the train being constant, no increase of its kinetic energy takes place, and the whole supply of energy from the steam goes to overcome the external resistances. In doing this the air is swept into eddies, whose motion gradually dissipates in heat, and any surfaces where friction is acting will also become warmer. A certain amount of noise is created, which means wave-motion in the air, which on account of air-friction gradually dies away and produces further heat. Thus many transformations occur, some of which have not been mentioned, but the total amount of energy is the same at all times, though its distribution is so different.

But though any one form may be directly or indirectly converted to any other form, it may not be all so converted. A system may have an amount of energy, but not all of it will be available for certain transformations. The second law of thermodynamics, for example, states that no engine can produce mechanical motion from heat energy, unless a difference of temperature exists somewhere in the system. In other words, the heat-energy in a system, however great its quantity may be, cannot supply mechanical motion, unless its distribution is irregular. Likewise with the energy of electrical distribution, a difference of potential is necessary for the production of mechanical motion. But a difference exists between these two cases; in the latter a perfect engine could convert the whole of the electrical energy into kinetic, because zero potential may be practically obtained, whereas a perfect heat-engine working within the available limits of temperature, and not using the absolute zero of temperature, cannot possibly convert all the heat into kinetic energy that is given to it. So when energy fritters away in heat, a portion is irrecoverable; and almost every conversion of energy involves some loss in heat. These considerations lead to the doctrine of the *dissipation of energy*, that the energy of the universe tends to degenerate to heat, and that this tends to become uniformly distributed and so render the available energy zero.

Enfantin, Barthélemy Prosper (1796–1864), a French theorist and social reformer, was born at Paris. In 1813 he entered the École Polytechnique, but had to leave Paris for joining in the defence of the city against the Allies. For some time he was a commercial traveller in different Continental countries, but in 1823 he set up in business at Paris, and in 1825 made the acquaintance of St. Simon, who made him the heir of his visionary schemes. When the Revolution of 1830 occurred Enfantin declared his programme, among his principles being communism, with temporary as well as permanent marriage, and the abolition of inheritance of property. [St. Simon.] He organised a model community, which failed owing to a quarrel with the director of the political part of the programme. He then established a kind of convent at Menilmontant, of which he became "le Père," but this was suppressed by the Government in 1832, and he was punished as an offender against public morals. His next step was to start a colony in Egypt. This failed, and he reappeared in France as a farmer. In 1841 he was appointed one of a commission to Algeria, and he wrote a work upon colonisation in Africa. He afterwards received an appointment upon the Lyons and Mediterranean railway, and passed the rest of his life in obscurity.

Engadine, a Swiss valley in the Grisons, on the banks of the Inn, bordering on Tyrol, and much loved of tourists for its picturesque villages and beautiful scenery. It is 50 miles long, of varying width, and is divided into the Upper and Lower Engadine. There are mineral waters. Many of the inhabitants migrate to make money, and then come home to live. The language spoken is called Ladin or Romanisch.

Enghien, Louis de Bourbon, Duc d' (1772–1804), son of Louis Condé, Duc de Bourbon, was born at Chantilly. At the Revolution he left France, and travelled in Europe. In 1792 he was in Flanders with the army of his grandfather, the Prince de Condé, and later commanded the vanguard in the war which ended in the peace of Lunéville in 1801. He then lived at Baden in retirement, and married the Princesse de Rohan Rocheforte. When Cadoudal's conspiracy (q.v.) happened the Napoleonists suspected the Duke of Enghien of having visited Paris. The mysterious visitor was really Pichegru. By a violation of territory Napoleon captured him in Baden, and he was brought to Strasburg and then to Vincennes, where he was shot. There is some doubt as to how far Napoleon was personally responsible for his death.

Engine, the generic term for any converter of energy from one form to another. Such arrangements are very numerous and widely different in principle and construction. Hence their classification brings the study of special examples under totally different headings. Thus the conversion of the heat-energy in steam to mechanical motion is effected by the *steam-engine;* the heat is supplied by the chemical combination of coal, petroleum, or other such fuel, with oxygen. The similar conversion of the heat-energy in the products of combustion of coal-gas is effected by the *gas-engine;* and of the heat-energy in hot air by the *air-engine.* Such engines producing mechanical motion are termed *prime-movers,* a term which also includes water-wheels and turbines. Such may further be classified as stationary or locomotive engines, the former including all those that remain in the same place giving rotatory or oscillatory motion to various mechanisms, and the latter all those that supply the energy for their own transference and perhaps that of a train of dependent carriages.

Engineering is the art of construction. As a profession, or class of professions, it includes metal-working and machine manufacture; the design and construction of roads, railways, canals, harbours, and docks; the building of bridges of wood, masonry, or metal; of masonry or earthwork embankments and dams; of trenches and military fortifications; the design and carrying out of systems of water supply, including storage, transit, filterage, etc.; of systems of drainage, irrigation, and sewerage; and, lastly, the production of electrical power and its disbursal, the construction and working of electrical instruments and of dynamo-electric machinery of all kinds. Thus the distinct professions in engineering are numerous: military, mechanical, civil, marine, hydraulic, hot-water, gas, mining, locomotive, sanitary, chemical, and electrical engineering. All these require special training, and the whole field is too vast to be within the grasp of one individual. The mechanical engineer has the greatest technical knowledge; he understands the nature and behaviour of materials, the method of their treatment, and their applicability to various structures. His knowledge of weak points in structures, the wisest modes of strengthening them, and of the plans to be adopted at the crises when they fail, is entirely practical and derived from experience that the highest theory could not with confidence teach him. Nevertheless, he cannot move onwards without theory; the principles of dynamics, physics, and mathematics are all-important to him, and if not sufficient to explain all his practically-acquired facts, they at any rate support such facts and enable him to predict others. Every engineer should if possible have a certain probation as a mechanic; those who have so served are taken in preference even where their intimate knowledge of handicraft and material are of no direct use. Such a knowledge is becoming more important every year in electrical work, which in its great advances must go hand in hand with mechanical engineering. Civil engineering may not in many connections demand much of this special technical knowledge, as, for example, in the laying-out of railways, or the construction of simple roads, canals, or other waterways. But even in these the mechanical engineer comes to the front, as when heavy bridge-work occurs on the road or railway, and aqueducts, locks, or sluices on the waterways. The ideal course for any engineer who is to design and construct at all should involve two years' theoretical work in mathematics, physics, chemistry, and engineering, and three years' practical training in some works, after which he should specialise in the one industry that he means to make his own.

Engineers, as a military term, used to denote that part of an army which occupies itself with the making of bridges, fortifications, and other military constructions, and prepares plans and surveys. In the British army the Corps of Royal Engineers consists of 40 companies, and undertakes among its other duties the execution of the Ordnance Survey. The non-commissioned officers and privates of the Royal Engineers receive a higher rate of pay than the ordinary infantry, and are for the most part recruited from among skilful artisans. The word is also used in the navy to designate those officers of a steamship who have the charge and management of the engines. The word has also a further and wider signification, in which it is equivalent to what the French call *mécanicien,* an engine-driver, and our English use of it in several distinct senses often puzzles foreigners.

England. *Physical Features.* The name England is often used as a political term to denote the united kingdoms of England, Wales, and Scotland, the three divisions of the largest island in Europe, which rises from a submerged plateau stretching from the Bay of Biscay to the N. of the Shetland Isles. Geographically, however, it is only applied correctly to that part of the island which lies S. of Scotland and E. of Wales, extending from lat. 90° 48′ to 55° 45′ N., and from long. 1° 45′ E. to 5° 44′ W., and covering an area of 50,823 square miles. Of this country the northern and south-western districts are of a mountainous character, the remainder, about two-thirds of the whole area, consisting of plains broken occasionally by low hills. One of the most marked physical features is an unusually long and indented coast-line affording excellent harbours, by means of which England, situated advantageously between the German and Atlantic Oceans, is able to command the trade alike of east and west. The climate, with a heavier rainfall on the W. than on the E., is milder, on the whole, than that of any region in the same northern parallel. The soil is rich in minerals. The tin mines of Cornwall, a county which still produces both tin and copper, were worked in the earliest period of which we have a record. The coal fields, most of which yield iron as well as coal, cover an area twice as large as that of Yorkshire. They extend over Northumberland, Durham, parts of Lancashire, Yorkshire, and Staffordshire, and the neighbourhood of Bristol. Lead, slate, building stone, and salt may also be mentioned among the natural productions of the country.

Industries. Thousands of men are engaged in mining. The smelting of iron is carried on most largely in the Cleveland district of Yorkshire, of which the chief town is Middlesborough, and at Barrow in Lancashire. Iron goods are produced in Birmingham, Wolverhampton and the neighbourhood, and cutlery at Sheffield. Lancashire imports cotton at Liverpool for use in the mills of Manchester and the towns near it. In the West Riding of Yorkshire woollen goods are made, especially at Leeds and Bradford. Pottery is manufactured in a district of Staffordshire, called "the Potteries." Ship-building is extensively carried on in London, Liverpool, Jarrow, and other ports. Agriculture is practised in the rural districts, which may be said to lie S. of a line drawn across the country from Devonshire to Hull, to the N. and W. of which the manufacturing and mining districts are mainly confined. Within the region of agriculture, hops are cultivated in Kent and Worcestershire for use in the breweries of Burton-on-Trent and other towns, in the preparation of the national beverage, beer.

Imports and Exports. The imports consist mainly of articles of consumption, such as animals for food, preserved meats, corn, coffee, tea, sugar, fruit, wines, tobacco, etc.; and of raw materials for manufactures such as cotton, wool, timber. The exports are mainly of articles manufactured in the country—cotton, woollen, and linen fabrics, iron goods, etc.

Population. A country with such industries is necessarily populous, in spite of a continuous drain through emigration to the colonies. By the census of 1891 England, apart from Wales, was shown to have 27,482,104 inhabitants.

Religion. There are upwards of 250 sects in the country, and a large number of people who stand aloof from all religious bodies. The historic Church of England, however, is still established legally. It has two archbishops and thirty-four bishops, each of whom presides over a diocese. Each diocese is mapped out into parishes, in every one of which is a resident vicar or rector. [ENGLAND, CHURCH OF.]

Justice is administered by magistrates, in the first instance, for the punishment of trifling offences, and in County Courts (q.v.) for the recovery of small debts, etc. The more serious cases are tried in the High Court of Justice, which has two divisions—the Chancery and the Queen's Bench. The judges of the Queen's Bench try criminal as well as civil cases, not only in London but in various towns on fixed circuits, which they visit three times in the year. In most cases they have the assistance of a jury (q.v.). Civil cases can be carried to the Appeal Court, and ultimately to the House of Lords, which, as an appellate tribunal, consists of such peers as hold, or have held, high judicial office.

Army and Navy. As the policy of England has long been unaggressive, and as an insular position is in itself a safeguard, there is no need for a vast standing army such as drains the resources of the Continental powers. The navy is maintained with special care, not only for the defence of the mother country, but for the protection of the various parts of the British Empire. (For details *see* ARMY, NAVY.)

History. Little or nothing, except as to their physical characteristics, is known of the people who preceded that Celtic race which we call "the Britons." These Britons were found by the Romans, who first attacked the country under Julius Cæsar in 55 B.C. In the course of the next century the Britons were forced to submit to the Roman rule, which was maintained by means of roads intersecting the country from N. to S. and from E. to W., and thus affording easy communication between the towns and fortified camps of the conquerors. During the period of Roman rule the Britons advanced in civilisation and formed a British Christian Church. In 410 A.D. the Roman legions were withdrawn, and the natives, long unused to self-protection, were left a prey to the tribes of Teutons, who now came from their home in the lands about the mouth of the Elbe, to settle in a country with whose wealth they had long been familiar through their predatory expeditions. As to what was the actual fate of the Britons during this new conquest, history is silent. Perhaps they were exterminated, probably they were enslaved, and by intermarriage with their masters gave some tincture of their blood to the future inhabitants of their land. The only marks which they have left on the language and literature of their successors are the legends of King Arthur, a few geographical names, and some common words such as "clout," "mattock," "mop." It was, however, only on the plains that the destruction was carried out. In the highlands of Cornwall the Celtic language only died away at the end of the last century, while it still lingers among Celtic peoples in the mountains of Wales and Scotland, just as it does in Man, Ireland, and Brittany.

The Teutonic or German invaders were divided into three tribes, the Jutes who settled in Kent, the Saxons, whose name survives in the last syllable of Essex, Middlesex, and Sussex, and the Angles who, having conquered the land from Essex to the Forth, finally gave their name to the whole country. All came fierce by nature, and doubly fierce with a warriors' creed. They looked forward with eager expectation to an immortal life of fight and feast among gods whose names still linger with forgotten meaning in the titles of our days of the week. But soon Augustine, a Roman missionary sent by the Pope in 596, arrived in Kent, and converted its king and people. Paulinus, his follower, became the evangelist of Northumbria. A Christian Church was thus just founded, when it had to meet two dangers—a danger from the forces of heathendom under Penda, King of Mercia, and a danger from a rival Church. The conversion of the North had been largely due to teachers who derived their doctrine from the Irish Church, which differed in certain points from that of Rome. A conference was held at Whitby in 664 A.D., with the result that the Roman usages were accepted. From this time the spiritual authority of the Pope was scarcely questioned in England until the Reformation, although, as we shall see, the English spirit of independence frequently protested against his interference in temporal matters.

It was long before the various tribes coalesced

into a single nation. The little kingdoms, "the Heptarchy," as they are sometimes called, struggled among themselves for supremacy, which was accorded to the strongest king of the time, under the title of Bretwalda. The work of consolidation continued until the beginning of the 9th century, when the King of Wessex, Egbert, succeeded in establishing his own power. In the year 827 he became overlord of Mercia and Northumbria, and thus practically first king of all the English, from the English Channel to the Forth. No sooner, however, was the union of all the Teutonic inhabitants of the country complete, than the whole Christian organisation was threatened by the invasion of fresh heathen tribes of the same blood, but known as "Danes," from Denmark and Scandinavia. The next century is marked by a long struggle, broken in the reign of Alfred by the Treaty of Wedmore (878 A.D.), which allowed the Danes to remain under his overlordship N. of a line drawn between London and the Dee. The weak reign of Ethelred II. (980–1016 A.D.) gave them fresh opportunities of aggression, of which they were not slow to avail themselves. A war broke out, which ended, after the death of Ethelred, in the accession of the Dane, Canute. Ethelred's son, Edward, was brought up in Normandy, and there gained a love for Norman ways which was destined in after years materially to affect the development of England. Meanwhile, Canute exercised a wide sovereignty wisely. King already of England and Denmark, he conquered Norway, and was recognised as overlord by the king of the Scots. A northern empire was thus founded which in strong hands might have become a lasting power, but Canute's sons inherited none of their father's genius, and when they died, the empire was already broken up. Edward, who had come back from Normandy, was made king of England in the year 942.

A king of slight force of character, Edward surrounded himself with Norman favourites, but was compelled to leave most of the real power of government in the hands of Godwin, an English earl. Upon the death of the king, the Witan or Assembly of Wise Men, the national Parliament, chose Godwin's son Harold to reign; but William, Duke of Normandy, claiming the crown in virtue of a promise made by Edward, landed with an army, and defeated and killed Harold at the battle of Hastings (1066 A.D.). King by conquest, William determined to establish his power by law, and so compelled the Witan to elect him in the usual way. The old Teutonic customs were now too deeply rooted in the country to be easily displaced, and the Normans, French as they were in language and customs, belonged to the same Teutonic stock as the English. Thus they suffered the English institutions to remain as the basis of the new polity. The old rule of the kingship had been that—within the limits of the royal house, which in heathen times claimed descent from the god Woden—the succession should be by election of the nearest relation of the dead monarch who was fit to rule in peace and lead in war. Once, as we have seen, in the case of Harold, the Witan looked beyond the royal house for a vigorous king; indeed, they actually set aside the claims of a prince who was still a boy. It may be noted in passing that the elective principle growing fainter in the course of subsequent history, but never entirely lost, was exercised by Parliament as lately as 1701, when the heir to the throne, being a Catholic, was excluded from the succession in favour of a Protestant kinsman. The Teutonic kingdom was formed by the union of several tribes, and was divided into shires, which still remain as divisions of the country. Each shire was ruled by an ealdorman, and had its own local government, an assembly with powers alike legislative, administrative, and judicial, at which all freemen had the right to attend. The shire was divided into hundreds or groups of several townships. Each township, composed of a number of families, had also its assembly. Society was divided into ranks; below the king came the earl, then the *thegn* or lesser nobleman, then the *ceorl* or freeman, and lastly the *thrall* or slave. In the development of this society, military service counted for much. The king and the nobles gathered bands of men around them whose fortunes depended on their own. Grants of land were the reward of aid in war, and so, at the time of the Norman Conquest, a system was already springing up akin to the more rigid Feudal System (q.v.) which prevailed afterwards. The aim of Feudalism was to produce an "army camped upon the soil." Lands were granted to tenants, and subdivided by them among under-tenants, on condition of military service, but every under-tenant in England was compelled to swear fealty to the king as well as to his own lord, in order to avoid the danger of a conspiracy among the tenants.

Besides the growth of this system of military land tenure, there were other lasting effects of the Norman Conquest. England was brought into closer connection with the Continent. The French possessions of the Norman dukes led to constant wars with France; the foreign influences and the centralisation of power in the hands of foreign rulers brought about a closer connection between the Churches of Rome and England. In the Contest concerning Investitures, when the Archbishop Anselm opposed Henry I. upon the homage claimed by the king from the holders of Church lands; in Becket's endeavour against Henry II. to keep spiritual courts for the trial of the clergy; in the imposition by the Pope of Stephen Langton as Archbishop upon King John; in the subsequent interdict upon the country, and attempt of the Pope to give away the crown of contumacious John to the French king, we see the steady and constant claim of Rome to spiritual dominion; while in the partial success of Henry I.; in the murder of Becket to please Henry II.; in the ineffectual struggles of John; in the statutes of Provisors and Præmunire, by which Edward III. denied the power of the Pope to dispose of benefices and to decide causes cognisable in the king's courts; and in the doctrines of Wyclif and the Lollards, we find the answer of English freedom already foreshadowing the great uprising of the Reformation. But beyond all other influences of the Conquest was the change wrought

in the people by the infusion of practically foreign blood. Once settled in the country, the Normans rapidly mingled with their subjects. The effect upon the language was shown by the loss of inflexions and the entrance of foreign words. The new nation found its first literary expression in the reign of Edward III. in Langlande and Chaucer. [ENGLISH LITERATURE.] Among constitutional changes may be noted a great advance towards the modern trial by jury, which was made by the first Plantagenet King, Henry II. In England before the Conquest trials had been conducted by ordeal (q.v.) or by compurgation (q.v.), and the production of witnesses. The reforms of Henry were based upon an extension of testimony. He ordained that twelve men from each hundred and four from each township should present reputed criminals for trial by ordeal. Under Edward I. witnesses acquainted with the particular facts were added to this kind of grand jury. Only one further step was thus necessary—the separation of the witnesses from the judges—to establish the jury as we now know it.

A yet more important constitutional change in the first centuries after the Conquest was the introduction of the representative system into Parliament. Like all English reforms, it came slowly and almost imperceptibly about. In the Witan all freemen had perhaps (at least in theory) the right of attendance, which, however, was necessarily inoperative when long and costly journeys were required to reach the place of meeting. The first beginning of representation is seen when special orders were issued to secure the attendance of those whose presence was desired by the king; but a true and effective representation was begun by Simon de Montfort, who was compelled by the misrule of Henry III. to take the government into his own hands, and who summoned to the assembly two citizens from every important borough and two knights from every shire. From this time Parliament continued to develop. Members received "wages"—usually two shillings a day—during their attendance in and journeys to and from Parliament, a custom which did not entirely die out until the 18th century, and which certain politicians are now anxious to revive. The clergy were summoned regularly to send representatives, but their unwillingness to serve in a secular assembly led to their only holding separate meetings of their Convocation (q.v.). In the reign of Edward III. the one House of previous Parliaments was divided into the two Houses of Lords and Commons, which have continued ever since.

So the foundations of our political freedom were laid. Meanwhile the power of England was expanding. In the reign of Henry II. a partial conquest of Ireland took place. Edward I. subdued Wales and Scotland, but the complete incorporation of the latter country with England was hindered by his death, when it passed out of the feeble hands of his son into a new independence. The English relations with France were warlike. John lost the dominions in Normandy which had belonged to the English crown since the days of William the Conqueror; but Edward III., claiming the French throne through his mother, Isabella, a French princess, began in 1337 a war, which, lasting until 1451, is known as the Hundred Years' War. Its course was marked by the victories of Crecy and Poitiers in the reign of Edward III.; by Agincourt in the reign of Henry V., and the recognition of that king as heir to the French throne on his marriage with Katharine, daughter of the reigning monarch; by the brilliant career of the peasant maiden, Joan of Arc, and the final expulsion of the English during the reign of Henry VI. Useless in its ultimate end, the war was disastrous in its effect upon English prosperity. Between the battles of Crecy and Poitiers, when the country was feeling the drain of men and money, a terrible plague, the Black Death, in the year 1349, swept away a large proportion—perhaps half—of the English population. With the scarcity of labour which followed, a rise of wages was the natural result, but this was sternly checked by the Statute of Labourers, which enacted that wages should continue to be paid at the rate usual before the plague. Discontent spread, and broke into revolt in the rising of the peasants under Richard II. The history immediately succeeding his reign is a record first of the French war already described, and then of the struggle between the Houses of York and Lancaster for the crown. A new period opened with the battle of Bosworth and the accession of the House of Tudor in 1485.

We now reach the transition from the mediæval to the modern world. The Renaissance (q.v.) and the discovery of America enlarged alike the mental and the physical worlds. Under Henry VIII. the Reformation (q.v.) set England free from the authority of the Pope, and paved the way for a toleration as yet almost inconceivable. A brief return to Catholicism under Mary was followed, under Elizabeth, by the complete establishment of the Church of England in its present form. In the reign of the latter came the noble outburst of literature in the writings of Shakespeare, Bacon, and Spenser [ENGLISH LITERATURE], and the great war with Spain, one partly of Protestants and Catholics, and partly for access to America, which already began to offer a home to English colonists. The peaceful succession of James VI., of Scotland, as the nearest heir by his descent from Henry VII. to the throne of England, secured the union of the two crowns. Good in this respect, the establishment of the Stuart dynasty was evil in another. Bigotry and extravagance in the character of James, combined to render a struggle between him and his Parliament inevitable. Puritanism (q.v.) was a rapidly rising creed, but James, devoted to the doctrine "No Bishop, no King," would make no concessions in the formularies and practices of the Church. His son, Charles I., pursued the same course, until, after trying every illegal way of raising money, and all means of maintaining religious uniformity, he found himself embroiled in war with his subjects. The Parliamentary forces at last succeeded, under Oliver Cromwell, in making him prisoner, after which his execution followed in 1649. Cromwell became Lord Protector of the Kingdom. During his rule the English were again called upon to engage

in war for the maintenance of their colonial position. The Dutch were now their rivals, and the war, ended for the time, broke out more fiercely in the reign of Charles II., who, after the death of Cromwell, was recalled to the throne. With his restoration Episcopalianism, lately suppressed, again became dominant.

The Test Act was now passed in 1673 to make the reception of the Communion in the Church the title to office, and in spite of enlarging toleration, it remained in force until 1828. The next king, James II., a Catholic, worked so injudiciously for his cause that his Protestant son-in-law, William of Orange, was invited to come over. Accordingly William and his wife ascended the throne in 1689—an event which is justly called "the Revolution," for it altered the character of the kingship. The period of the Tudor and Stuart dynasties (1485–1688) may be described as one in which the object of the sovereign had been to secure personal rule. The Revolution, by substituting a parliamentary title in place of the Tudor and Stuart theory of divine right, secured the dependence of the crown on Parliament, and reasserted the forgotten right of election.

The death of William occurred on the eve of a useless war with France, which was marked, under his successor, Anne, younger daughter of James II., by the victories of Marlborough (q.v.). Her reign is also memorable for the literary activity of Swift, Pope, Addison, and Steele [ENGLISH LITERATURE], and for the union of the English and Scottish Parliaments in 1707—a step rendered necessary by commercial disputes, and by the danger that the Scots, on the death of the queen, would elect the Catholic son of James II. as king, instead of the more distant, but Protestant, heir of the House of Hanover, in whom the Act of Settlement of 1701 had vested the succession. That this fear was not unfounded, is shown by the outbreak on behalf of the Stuart Prince which occurred immediately after the accession of George I. The rebellion, promptly suppressed, left an interesting memorial in the form of the Septennial Act of 1716, by which, through fear of a majority in favour of the Stuarts, the duration of Parliament was raised from the then usual period of three years to seven. To-day there is some agitation for a return to the triennial system.

With the reigns of George II. and George III. we reach the greatest events of the 18th century—the Seven Years' War (1756–63),—the third and greatest war for a colonial position, by which England wrested the actual possession of Canada and the future possession of India from the French; and the American War (1775–83), raised on the question whether England had a right to tax the colonies, which were not represented in Parliament. Its results were as inglorious for England as those of the previous war had been glorious. After repeated disasters, the English were obliged to acknowledge the independence of the United States. At home the events of the French Revolution of 1789 were watched with keen interest and fear. The rise of Buonaparte compelled England to make war, and secured the triumphs of Nelson and Wellington (q.v.).

The 19th century opened in 1800 with the union of the English and Irish Parliaments—an event which is still leading to great political excitement; but as far as England is concerned the most important political changes of the century have arisen directly out of social needs. The great towns which rose in the Midlands and North of England with the improvement of machinery and the introduction of steam, rendered an extension of the franchise necessary. By the Reform Bill of 1832 votes were given to the whole of the middle class, by that of 1867 to artisans in towns, and by that of 1884 to agricultural labourers. Meanwhile, it was felt that political power could not safely be left in the hands of ignorant masses. Elementary education has received pecuniary aid from Government, accompanied eventually by inspection and control, since 1833; and by the Education Acts of 1870 and 1876, School Boards were set up, and the attendance of children made compulsory. [EDUCATION.] By the Local Government Act of 1888 the establishment of representative County Councils made one more step in the democratic direction in which the political progress of this country has long tended.

Present Constitution. We have now traced the development of the English Government, and may note briefly a few of its characteristics. It is based rather on tradition and the evolution of accidental changes than on definite enactments. The sovereign, once practically despotic, "reigns, but does not govern." The ministers are responsible for everything, and they are chosen, to-day, nominally by the monarch, virtually by the people through their representatives in the House of Commons. The power of the sovereign is purely personal, and is limited to the influence which his character and experience can bring to bear upon the ministers of the hour. The real government, both legislative and executive, is in the hands of the Cabinet, a body recognised by no statute. It consists generally of from twelve to sixteen members, who comprise the First Lord of the Treasury, the Lord Chancellor, the Chancellor of the Exchequer, and the principal Secretaries of State. Its head is the Prime Minister, who can be any of the above ministers except the Lord Chancellor. His relation to his colleagues is undefined, and depends on his own force of character and their pliability. The Cabinet remains in office only while supported by a majority in the House of Commons. Upon the first adverse vote on a question of importance, it resigns or advises the sovereign to dissolve Parliament in order to submit its policy to the electors.

In these proceedings the House of Lords has no part. Nominally the Upper House, its power is not so great as that of the Commons. It can check legislation, since no measure can become law without its consent; but this check is lessened by the fact that in practice the Peers cannot long resist the passing of a bill on which the country has shown itself bent at the general elections. In both Houses measures are considered clause by clause in committee, at which stage the Lords can largely modify a bill which they dare not reject. The number of Peers is liable to increase, as eminent commoners are often raised to a peerage. At present the house consists of about 560 members.

The right to sit is hereditary, except in the case of sixteen Scottish and twenty-eight Irish Peers, who are elected by their fellows, the former for a single Parliament, the latter for life; in that of four law lords, who hold life peerages; and in that of the two Archbishops and of twenty-four Bishops, whose seats secure for the clergy the representation in the Upper House, of which, as we have seen, they refused to avail themselves in the Lower. The House of Commons contains 670 members, the majority of whom constitute the support of the ministry. The remaining members, who may form one party or several parties, are called "the Opposition," and fulfil an important function in criticising the proposed measures of the Government, and thus securing that every clause shall be submitted to rigid scrutiny. Hitherto the two permanent parties in both Houses have been Conservatives and Liberals—the former devoted to the maintenance of the established institutions of the country, the latter taking as their watchwords progress and reform. At present, besides two Irish parties, there is, in addition, a Labour party rising, which aims at effecting legislative changes of a social character. It is, indeed, safe to say that, apart from the Imperial questions, which England's position, at the head of the greatest empire in the world, necessarily brings to the front, problems affecting the physical and social welfare of the masses are more and more taking the place once filled by purely political interests.

England, CHURCH OF. "The Church of England as by law established" is a corporation which at least in outward form and organisation dates back almost from the beginning of the nation. Its chief pastor is the Archbishop of Canterbury, as was the case also at the beginning of the seventh century; but, as will presently be seen, the identity of the present with the ancient body is a matter of serious controversy.

The Church of England was founded by Augustine, a monk sent from Rome by Pope Gregory the Great A.D. 596. He landed in Kent, and after a few years converted its king, and was consecrated Archbishop of Canterbury. The conversion of the country, however, was slow; it was divided into several kingdoms, and the internecine wars and jealousies were a great hindrance. Nevertheless, Christianity at length prevailed, and the country was marked out into episcopal sees. It was Archbishop Theodore (668–690) who unified the Church of England by bringing the bishops into one body under himself as primate. A few years later, under Egbert, its seventh bishop, York was made an archbishopric, with the northern bishops as suffragans of it. England was still divided into several kingdoms, but in 814 the union of kingdoms followed that of sees. The parochial system was organised as it remains to the present day.

How far these sees were under the authority of the Bishop of Rome is a matter on which theologians dispute, and we cannot discuss it here; but all agree that from the time of the Norman Conquest, when William I. pursued the policy of bringing England within the range of Continental politics, the power of the Popes greatly increased in England. The Conqueror and his sons sought their assistance in difficulties, and the Popes in their turn put forward claims in a far more authoritative mode than before—claims which reached their height when King John was constrained to lay his crown at the feet of the Papal legate and to declare that he held his kingdom as a fief of the Holy See. From this time onward a reaction set in against the Papal claims, and legislation more than once was directed against them, especially during the reign of the first three Edwards.

The opponents of the Roman theory of the Church allege that there was a corresponding development of doctrine, and that opinions grew up concerning the ministry and the sacraments, which were not held in the days of Augustine. Whether or no, it is certain that in the fourteenth and fifteenth centuries strenuous attacks were made on the received theology, the central figure among the opponents being that of John Wyclif. The preachers of the "new doctrines" were known as Lollards, and fierce laws were made against them, subjecting them to death by fire.

In the sixteenth century came that great movement all over Europe known as the Reformation, the repudiation by a large portion of Christendom of the authority of the Bishop of Rome. The English Church followed the example of the Lutheran and Calvinistic religionists, but with noteworthy differences. The nation, as a body, declared that the Bishop of Rome had not by Divine right any authority over the Crown or Church of England, and proceeded to a measure of self-reform. This work began in the reign of Henry VIII., was carried on in the reign of Edward VI., came to a check under Mary, but was again taken up and completed under Elizabeth. The liturgy of the ancient Church was turned into English, but certain doctrines and devotions in it were expunged, on the ground that they were not warranted by the Scriptures nor by primitive custom. Hence the liturgy of the Church of England is in some respects like, in others unlike, that of the Roman Church. The Communion Service is to all intents and purposes modelled on the ancient liturgies; but the most remarkable feature of the English Reformation was the preservation of the old organisation. This stands unique in the history of the Reformed Churches. The bishops were consecrated by other bishops who had belonged to the ancient system, and the succession was unbroken. Matthew Parker's consecration as Archbishop of Canterbury under Elizabeth was on the ancient lines, and the Lambeth archiepiscopal registers stand on the shelves in an unbroken line—Wareham, Cranmer, Pole, Parker, and so on. The reformed liturgy took the place of the Latin service on Whit Sunday, 1549, and though there was a break under Mary, was resumed again under Elizabeth.

But in such a movement there were necessary difficulties and troubles. There were some who thought the reforms should have been more sweeping, and others who would fain have had them less so. To the former party must be traced the origin

of Nonconformity, the assertion of more independent thought and action than were found in the advocates of traditional beliefs. In the others we see the founders of the High Church school, which found its partisans in Hooker, Andrewes, and Laud.

These divisions of opinion continue still not only outside but within the Church. Some churchmen hold that the episcopate and the priesthood are essential features of any true branch of the Catholic Church ; others that, though desirable, they are not necessary. The Roman Catholics hold that. since the authority of the See of St. Peter is set at naught, the preservation of the old organisation avails nothing.

The conflict between the Church and the Nonconformists came to a climax under Charles I., and the identification of the Church with the State policy of the king, in the popular mind, led to the temporary overthrow of the Church with that of the throne. After twenty years both were reinstated, and both have ever since continued. The failure of the Church, however, under the first Georges to preserve her independence and her spiritual life lost much ground to her. Under the preaching of Wesley took place a great revival, and, though its primary effects were outside the Church, the result has been a marked growth of life and energy. The Evangelical movement of the latter part of the eighteenth century was largely owing to his influence. To that movement succeeded that known as the "Tractarian," so called from the tracts put forth under the influence of John Henry Newman (1833–1841). Both of these movements are still bearing fruit, the one in the increased earnestness of preaching, the other in the growth of outward ritual and of Church restoration. The Church has of late years shown great energy in mission work, both at home and abroad; great sums of money have been spent on churches and schools, as well as in the creation of the Colonial Episcopate.

English Language. [ALPHABET, GRAMMAR, LANGUAGE, PHILOLOGY.]

English Literature, the most remarkable as it is the most prolific of modern intellectual developments, is the product of many centuries. Mutation and transition necessarily marked its course before it attained to anything like its present perfection of form, and fulness and vigour of expression. Before the Saxons invaded Britain there was a Celtic literature of a rhythmic character, preserved, in the main, orally by the Gaelic and Cymric elements of the population. Gaelic literature is associated with Fionn, Ossian, and the battle of Gabhra, alleged to have been fought A.D. 284, while Cymric literature finds powerful utterance in Aneurin's poem, the *Gododin*, which celebrates the battle of Cattraeth, fought, according to tradition, in the year 570. During the 5th and 6th centuries various Teutonic tribes effected a settlement in Britain, and the island was ultimately subjugated by the Saxons. The institutions and language of the conquerors were largely imposed upon the natives, and so great has been the vitality of the Saxon speech that about two-thirds of the words now composing the English language are, radically or derivatively, of Saxon origin. Gildas, the author of a Latin treatise on British history, is the precursor of the Anglo-Saxon writers, but the earliest author of real distinction is St. Columbanus, an Irish missionary to Western Europe, who wrote religious treatises and Latin poetry, and died in 615. Cædmon, a monk of Whitby, was, however, the first Anglo-Saxon writer of eminence who composed in his native tongue. Encouraged by the Abbess Hilda, he wrote his *Paraphrase*, in which he discoursed of the Creation and the Fall, and other Biblical themes. His verse was constructed neither in measure nor rhyme, but it was differentiated from prose by a kind of rough poetic alliteration. After Cædmon, who died about 680, came Aldhelm, Ceolfrid, and others, while there is also an anonymous work of importance, the romance of the Northern hero *Beowulf*. This poem may be described as the heathen complement to Cædmon's Christian *Paraphrase*. The next great name in our early literature is that of the Venerable Bede, who was born at Jarrow, and became the great monastic teacher of Wearmouth, dying in 735. He wrote numerous works in Latin, the chief of which was his famous *Ecclesiastical History of the Anglo-Saxons*. Alcuin (735–804), a native of Northern England and an earnest student and teacher, became the chief intellectual light in the Court of Charlemagne. John Scotus Erigena (d. 877) wrote, among other things, a work on the *Division of Nature*, which is regarded as laying the foundation of the scholastic philosophy. King Alfred (848–901), great in arms and noble and enlightened in character, translated into Anglo-Saxon the histories of Bede and Orosius, and Boethius's *Consolations of Philosophy*. Other contributions to literature are likewise attributed to him. Ælfric, the grammarian, who died in 1006, wrote his eighty *Homilies* for the use of the common people. An anonymous poem on the battle of Maldon recites with spirit the victory of the Danes over Byrhtnoth. The well-known *Saxon Chronicle* is a survey of early English history, written by various authors. It began soon after the time of Alfred, and continued to the death of Stephen in 1154. Among its entries in verse is a spirited poem on the battle of Brunanburh, fought victoriously by Athelstan against his combined Danish and Celtic foes in 937. Besides the leading writers above cited, there were others of less importance who graced the Anglo-Saxon period of our literature—a period embracing some five hundred years from the time of Columbanus to the Conquest.

New conditions were imported into the learning and literature of England by the Norman Conquest. For nearly a century and a half the old language was supplanted by French and Latin. Monastic chronicles were the order of the day, and these were only of real value as they drew near to, and actually dealt with, contemporary events. Two of the most important of the monastic chroniclers were Ordericus Vitalis (1075–1142), who wrote the *Ecclesiastical History of England and Normandy*, a conscientious if disorderly record, and William of Malmesbury, who flourished at the same time,

and wrote a *History of English Kings*. The latter writer has been placed by Milton next to Bede. Geoffrey of Monmouth, Bishop of St. Asaph, who died in 1154, wrote the *History of British Kings*. Much of this Latin chronicle is imaginative. It began with a mythical Brutus of Troy, and ended with Cadwallader. King Arthur was a prominent figure in the book, and from this time the romantic legends concerning him and his court became a prominent feature in the Anglo-Norman literature. Geoffrey of Monmouth's *Chroniele* was abridged by Alfred of Beverley, and rewritten in French verse by Geoffrey Gaimar and "Maistre" Wace, the latter version becoming permanent as the *Roman de Brut*. Wace, who died in 1184, was also the author of the *Roman de Rou*. Walter Map or Mapes (1150–1196), poet and prose writer, gave form and substance to the Arthurian legends, uniting them into a harmonious whole as the spiritual allegory of the Holy Grail. Map attacked the abuses and corruptions of the Church in a series of witty and vigorous Latin poems. Hitherto there had been no man of such genius amongst our early writers. Early in the 13th century English began to recover its position, and Layamon's *Brut* was the first important piece of literature in transition English. Layamon, who was "a priest of Ernleye-upon-Severne," wrote in English verse, and he interpolated many things into Wace's narrative. His work was completed about 1205. A St. Augustine canon, named Ormin, was the author of *Ormulum*, a metrical paraphrase, with expositions, of the Gospel of the day. To the same period belong the early ballads of the Robin Hood type and the rendering into English verse of *Havelok the Dane* and other metrical romances. Roger Bacon, the great scientific investigator, was a Franciscan who settled at Oxford under Robert Grosseteste (afterwards Bishop of Lincoln). Bacon enshrined the results of his knowledge in his *Opus Majus*, *Opus Minus*, and *Opus Tertium*. Robert of Gloucester was a monk in the time of Henry III. and Edward I., who wrote in English rhyme a chronicle from the siege of Troy to the death of Henry III. William of Wadington, a Yorkshireman, wrote in French a *Manuel des Péchés*, which Robert de Brunne translated into English as *A Handling of Sins*. De Brunne also wrote a *Metrical Chronicle of England*. A collection of proverbial sayings, embodying the wisdom of the people, was gathered together at the close of the 13th century under the title of *Proverbs of Hendyng*.

The first great era of English literature may be said to begin about the year 1300, and to extend to the introduction of printing by Caxton in 1477. The overshadowing name in this period is that of Chaucer, who has been styled the Father of English Poetry. The accounts of his early life are uncertain, but he acquired the favour of Edward III. through John of Gaunt. In the reign of Richard II., however, he fell upon evil times, and he died in the year 1400 at the age of 72. His *Canterbury Tales* are immortal, alike for their poetic qualities, their unrivalled delineations of character, and their pictures of the middle-class English life of the period. Although the poet was influenced in his style and choice of subject by Dante and Boccaccio, he infused into his creations a dramatic force and a breadth of sympathy which are the characteristics of the highest genius. His earlier and minor poems—such as *The Romaunt of the Rose*, *The Court of Love*, and the *House of Fame*—were the fruit of his French and Italian studies. Hallam classes Chancer with Dante and Petrarch in the mighty poetic triumvirate of the Middle Ages John Gower (1325–1408), next in contemporary importance to Chaucer, wrote the *Confessio Amantis*, an English poem, which included a number of tales that were moralised to illustrate the seven deadly sins. Langlande, or Longlande, author of *The Vision of Piers Plowman*—a poem which stands out for its graphic force—"sought to animate men to the search for Christ, and battled vigorously with Church corruptions." Langlande is more distinctly English in his language than Chaucer, and his poem was a representative one as showing the workings of the national mind in religion and politics. James I. of Scotland takes high rank for *The King's Quhair*, and Lawrence Minot for his series of poems on the victories of Edward III. Barbour's heroic poem of the *Bruce* also calls for mention. Thomas Occleve, author of a poem on the duty of kings, and John Lydgate, to whom we owe the *Falls of Princes*, and other compositions, were likewise considerable poets. For a long period Sir John de Mandeville was regarded as "the father of English prose," but this claim is now abandoned. The larger portion of his *Travels* was borrowed from a worthy Friar Odoric (1330) and from other writers, while the whole narrative is more entertaining than veracious. John Wyclif (1324–1384), who gave to his countrymen the first English version of the whole Bible, has been not inaptly styled the "Morning Star of the English Reformation." Sir John Fortescue, Chief Justice in the reign of Henry VI., was the author of a fine legal treatise, *De Laudibus Legum Angliæ*, and of an admirable constitutional work on the *Difference between Absolute and Limited Monarchy*, in which he contrasted the French rule with the English to the disparagement of the former.

William Caxton, who introduced the art of printing into England, gave an impetus to literature whose effects have been of incalculable value. The earliest work which can with certainty be maintained to have been printed in England was the *Dictes and Sayings of the Philosophers*, published in 1477. In 1474, however, Caxton had issued at Bruges the first book printed in the English tongue, the *Recuyell of the Historyes of Troye*, and soon after this he printed the *Game and Playe of the Chesse*. Caxton was a most assiduous workman, and produced editions of Chaucer, Lydgate, Gower, and Sir Thomas Mallory's *King Arthur*, translations of Cicero's *De Senectute* and *De Amicitia*, and other works. A cluster of fine poets adorned Scottish literature at this period, including Robert Henryson, schoolmaster of Dunfermline, who wrote the first English pastoral, *Robin and Makyn*, and a sequel to Chaucer's *Troilus and Cressida;* Gavin Douglas, Bishop of Dunkeld, who completed the first English translation of the

Æneid; Sir David Lyndsay of the Mount; and William Dunbar. Lyndsay's *Play* or *Satire of the Three Estates* "was the most important example in our literature of the Morality Play that expressed moral teaching by the dramatic action of personified attributes and forms of life. It shadowed forth the reform wanted in the Church of Scotland, and the passing of the Estates in 1540 of what was called a friendly act of reformation was prepared for by the public acting of this satire in the presence of the king." In his poem on the *Monarchie* Lyndsay became distinctly Lutheran. William Dunbar, the Chaucer of the North, was placed by Sir Walter Scott at the head of the roll of Scottish poets. Dunbar led a chequered life, and his works are remarkable for their strong human lights and shadows. His allegorical poem, *The Thistle and the Rose*, was written in celebration of the marriage of James IV. with Henry VII.'s daughter Margaret. *The Golden Terge*, another of his poems of fantasy, is very descriptive and rhetorical. *The Dance of the Seven Deadly Sins* powerfully depicts—under the lead of Pride—a procession of the seven deadly sins in the infernal regions. Dunbar was equally remarkable in the comic as in the serious vein. He died about 1520. England had no contemporary poets equal to these. Alexander Barclay produced a satirical allegory, *The Ship of Fools*; Stephen Hawes, *The Pastime of Pleasure*, an allegory upon the course of life; and John Skelton his *Colin Clout*. Skelton was the strongest, as well as the coarsest of the three, and his vigorous satires against the clergy drew down upon him the anger of Wolsey.

At the close of the 15th century many of the best spirits of the age were drawn to Oxford for the study of Greek. It was taught by William Grocyn and the physician, Linacre. Erasmus came over from Paris to acquire it, and while at Oxford he made the acquaintance of young Thomas More, who wrote a defence of the new branch of learning. More afterwards entered upon the thorny paths of statecraft, and paid for his opposition to Henry VIII. with his head. More was the leading prose writer of his time, and his *Life and Reign of Edward V.*—in which he draws a sombre picture of the usurper Richard—is the earliest specimen of classical English prose; but his real fame rests upon the *Utopia*, in which he imagines an ideal commonwealth in the New World, discovered by a supposed companion of Amerigo Vespucci. The root idea was borrowed from Plato. More was jealous of a too popular treatment of the Scriptures, and published various treatises against the Lutheran doctrines. When William Tyndale completed his famous translation of the New Testament in 1525, More adversely criticised it on the ground of its Lutheran bias in the choice of words. Tyndale replied with spirit, however, and also defended against More the exposition of the Lord's Supper published by John Frith. In 1530 Tyndale completed, with the help of Miles Coverdale, his translation of the Pentateuch, and six years later he was put to death for heresy in Belgium. Coverdale's translation of the whole Bible appeared in 1535. Many Church writers and reformers flourished at this time. To Cranmer was largely due *The Book of Common Prayer*, a work which contains some of the noblest specimens of English in our literature. He was also responsible for a book of *Twelve Homilies* and a revised translation of the Scriptures, known as *Cranmer's Bible*. The martyr Latimer was the author of sermons which are rare specimens of vigorous eloquence, while Bishop Fisher preached and wrote trenchantly on the other side. John Leland, who died insane in 1552, was the father of our archæological literature. John Knox, the great Scottish reformer (1505–1572), wrote a *History of the Scottish Reformation*, and he was so indignant at the fact that three ruling sovereigns were women that just before the accession of Elizabeth he issued from Geneva his *First Blast of the Trumpet against the Monstrous Regiment of Women*. John Foxe, the martyrologist (1517–1587), did much for Protestantism by his work on the *Acts and Monuments of the Church*; and Roger Ascham (1515–1568), classical tutor to Queen Elizabeth, and author of *Toxophilus* and *The Schoolmaster*, was the first writer on education in the language. Mention must not be omitted here of the unfortunate Earl of Surrey (1515–1547), who was the first writer of blank verse in England, and who did much to invest our poetry with accuracy, polish, and a general spirit of refinement. Surrey used the medium of blank verse in translating two books of the *Æneid*. With his friend, Sir Thomas Wyatt (1503–1541), he also transplanted the sonnet into the garden of English verse.

The most brilliant, as well as the most virile, era in English literature was that extending from the accession of Elizabeth in 1558 to the closing of the theatres by the Long Parliament in 1648. No other period of ninety years in our history exhibits such a profusion of literary effort and achievement, especially on the dramatic and imaginative sides. The former portion of this period, however, known as the Elizabethan age—but really extending to the middle of the reign of James I.—was the greater in conception. It witnessed not only the rise but the culminating splendour of the drama. Miracle plays or mysteries were the forerunners of the drama. They were acted in churches and convents, and by their dramatic representations of Biblical episodes it was sought to influence the people in favour of virtue. There was something grotesque, however, in the choice of Satan as the first comedian, while the general treatment of sacred subjects was most objectionable. In course of time the plays changed into moralities, in which abstract qualities such as Justice and Vice took the place of Scripture characters. Next to these, and before the drama proper, came a series of farcical productions, of which Heywood's *Interludes* may be taken as a type. One great name interposes between these early plays and the drama, namely, that of Edmund Spenser (1553–1599). He restored the glory of English poetry from the long eclipse it suffered after the death of Chaucer. Spenser's *Shepherd's Calendar* applied pastoral images to the religious conflicts of the time, and under the name of Algrind he introduced Archbishop Grindal, whose firmness in encouraging free search for Scripture

truth he applauded. To his master, Chaucer, the poet paid tribute under the name of Tityrus. In 1590 Spenser published his great but unfinished allegorical epic *The Faërie Queene*, in which he depicted man with all his capacity for good striving heavenwards. The work is "an intense utterance of the spiritual life of England under Elizabeth." Spenser's *Colin Clout's Come Home Again* was written in memory of his friendship for Sir Walter Raleigh. The purely poetic qualities were redundant in Spenser, and these have made him a favourite with all his singing brethren since his death. Sir Philip Sidney (1554–1586) has gained a reputation as an English classic for his *Defense of Poesie*, but his romance of *Arcadia* is the more widely known, as it was the more warmly appreciated on its publication. Later critics have censured it, but it is rich and highly finished in its phrases, and "full of fine enthusiasm and courtesy, of high sentiment, and of the breath of a gentle and heroic spirit."

The first English comedy, *Ralph Roister Doister*, was written by Nicholas Udall, Master of Eton, between 1534 and 1541. It was avowedly modelled upon *Plautus*, and intended for the edification of Eton boys. The first tragedy was *Gorbodue*, a new rendering of the old British story of Ferrex and Porrex by Thomas Sackville (Lord Buckhurst), and Thomas Norton. It was acted at the Inner Temple on the 1st of January, 1561, and also before the queen by command. It substituted English for Latin in a play constructed after the manner of Seneca, and "its grave dwelling upon the need of union to keep a people strong, a truth of deep significance to England at that time, pleased Elizabeth." But nearly twenty years yet elapsed before the drama obtained a stable hold, and theatres began to be built. John Lyly, author of the *Euphues*, wrote a number of mythological plays, and George Peele produced *The Arraignment of Paris* and *The Device of the Pageant* in 1584–85; but Christopher Marlowe, with his "mighty line," was the first great Elizabethan dramatist. His genius was sombre, and his tragedies dark and terrible. His *Tamburlaine the Great* was produced in 1587, but his *Doctor Faustus* was not published until ten years after his death, which occurred in 1593. Robert Greene, Thomas Lodge, and Thomas Kyd wrote during the last two decades of the 16th century; and at this time began the career of the greatest poet the world has ever seen, William Shakespeare (1564–1616). A period of less than 25 years covers the production of all those comedies and histories which are the wonder of modern literature. We marvel what kind of man that could be whose intellect could conceive such widely different works as *A Midsummer Night's Dream*, *Venus and Adonis*, *Romeo and Juliet*, *The Rape of Lucrece*, the famous *Sonnets*, *The Merchant of Venice*, *Othello*, *Macbeth*, *King Lear*, and *Hamlet*. Shakespeare seems to sum up within himself the whole of poetry and of human philosophy. His power and universality are unique, and will probably ever remain so. Ben Jonson, the greatest and most scholarly of his contemporaries, wrote from 1596 to 1637; but he lacked the freedom and naturalness of Shakespeare. Beaumont and Fletcher worked in unison with a success rarely attained by collaborators. Massinger was a dramatist of undoubted power, as his *New Way to pay Old Debts* testifies; and Dekker, Heywood, Marston, and Middleton would all have taken a higher niche in the temple of fame had they lived in a less prolific age. Ford and Webster produced plays of a dark and terrible cast, and the list of Elizabethan dramatists closes with James Shirley, who was purer in thought and expression than any of his predecessors. With regard to other poets of this period, Thomas Tusser gave an excellent picture of English peasant life in his *Five Hundred Points of Good Husbandry*, and Michael Drayton described this favoured isle itself in his *Polyolbion*. The learned John Donne gave utterance to his metaphysical conceits, while Drummond of Hawthornden attested his claim to the title of the finest Scottish poet of his day. Carew, Herrick, and Suckling produced their exquisite lyrics, and Herbert chanted the solemn strains of *The Temple*.

The great prose writers of the period must be headed with the illustrious name of Francis Bacon (1561–1626). The father of the inductive philosophy was regarded by those of his contemporaries who knew him best as "one of the greatest men and most worthy of admiration that had been for ages." His adventurous intellect could not be bound by mere tradition. He brought his keen analytical faculty to bear upon the study of man and nature, so that in his matchless *Essays* we have the result of his penetration into the human mysteries, while his philosophy of nature stands revealed in the two books of the *Advancement of Learning*, in which he laid the basis for his *New Organon*. "Who is there," Burke demands, "that upon hearing the name of Lord Bacon does not instantly recognise everything of genius the most profound, everything of literature the most extensive, everything of discovery the most penetrating, everything of observation of human life the most distinguishing and refined?" George Buchanan (1506–1582) ranks as the Scottish Virgil from the elegance of his Latin verse, while he exhibited equal command over Latin prose. Richard Hooker (1553–1600) gave a new elevation and dignity to English prose by his *Laws of Ecclesiastical Polity*. Sir Walter Raleigh, the admirable Crichton of his age, carried the English name abroad, but returned only to find imprisonment and the scaffold (1618). He glorified his prison life by the production of his great *History of the World*, which is especially memorable for its vivid recital of the histories of Greece and Rome. Camden the antiquary constructed his *Britannia*, and Hakluyt and Purchas indited their wonderful records of travel. James I. threw his ill-digested learning into treatises on Divine Right, Witchcraft, etc.; Burton wrote his quaint and erudite work, *The Anatomy of Melancholy*; Selden, the chief of the learned men of his time, according to Milton, alternated politics with the production of his *Treatise on Titles of Honour* and his *History of Tithes*; Hobbes of Malmesbury, the terseness of whose style is unique, promulgated his theory of action and morals, as well as his

absolutism in politics, in the *Leviathan;* Howell first showed what correspondence might become in his *Familiar Letters*, and genial old Izaak Walton wove an immortal spell over all lovers of good literature by his *Lives of Donne, Hooker*, and others, and *The Complete Angler*. Altogether the age was one eminently full of intellectual life.

The decline of the drama, and the end of what we may call the Pagan Renaissance, were contemporaneous with the birth of the great constitutional struggle which began with James I. and did not terminate until the Revolution. It is strange that such a time of upheaval should have produced the greatest Christian epic, *The Paradise Lost*, and the greatest Christian allegory, *The Pilgrim's Progress*, which are to be found in any literature. Three great men represented the various forms of the religious struggle going forward; the saintly Jeremy Taylor (1613–1667), a poet amongst preachers, upheld the cause of Episcopacy; Richard Baxter (1615–1691), while desiring the church discipline and the form of belief, advocated a greater liberty for the individual conscience; and John Milton (1608–1674) was a type of the religious freedom and toleration which found best exposition in the principles of the Independents. Milton's *Eikonoklastes* broke down the buttresses of kingly authority; his *Areopagitica* was a noble argument in behalf of intellectual liberty; while his *Paradise Lost, Paradise Regained*, and *Samson Agonistes* were not merely magnificently great as poetry, but Christian evidences of the most sublime type. John Bunyan (1628–1688), a man of the people, came forward with words that burn and images that enthral, to show the way from a world of vice to a pure and Holy City. Thomas Fuller, remembering that "blessed are the peacemakers," sought to heal that strife between king and people which was beyond all healing save that of the sword. Some men held themselves aloof from violent controversy while yet maintaining independence of thought—as, for example, Thomas Browne in the *Religio Medici*, published in 1642. The anti-Puritans had their champions in Samuel Butler, whose fierce wit blazed forth in *Hudibras;* in the great Royalist writer, Clarendon; and in that staunch Royalist and Churchman, Bishop South, whose antipathy to the Nonconformists may be partly condoned by his brilliant wit. Among other writers of the time may be mentioned the versatile Barrow; the powerful satirists Wither and Bishop Hall; Harrington, the author of the *Oceana;* the patriotic Algernon Sidney, with his admirable *Discourses on Government*; and those garrulous but inimitable chroniclers Pepys and Evelyn. The poets were many and varied, including Waller, Davenant, Denham, Marvell, Lovelace, and Cowley. Extremes always lead to revulsion, and from Puritanism we pass to the licentious Court of Charles II., with the songs of Rochester, and the works of Etherege. The comic dramatists of the Restoration and the period immediately succeeding—Wycherley, Congreve, Vanbrugh, and Farquhar—vividly and wittily reflect the glittering life and base morality of the age. One stronger intellect did bring with it for a time the sense of a fresher and diviner air, when John Dryden sang with vigour and insight, and also produced his best comedies and tragedies. Otway likewise showed a momentary gleam of the old Elizabethan dramatic fire. In the sphere of mental and natural philosophy, Locke, Newton, and Boyle grappled with problems hitherto considered insoluble, and illumined for the world the devious and mysterious paths of scientific inquiry. The selection of names in every branch of English literature, and in every age, can, of course, only be illustrative, not exhaustive.

The 18th century witnessed a great revolution in our literature, especially on the poetic side. Imagination, passion, and nature, were dethroned, and poetry became didactic, philosophical, and political. Dryden manifested something of the qualities of both schools, but when Alexander Pope arose (1688–1744) the new order triumphed. Everything was sacrificed to precision and artificiality. Pope was the most brilliant and impressive of the new writers. His *Essay on Man* and his *Essay on Criticism* enshrined many old philosophical truths in epigrammatic form. The heroic couplet became in his hands an instrument for cutting diamonds, but the lover of poetry longs after a time to exchange his dazzling couplets for the flowers of poesy. In all that he did, however, whether the work took the form of satires, essays, epistles, or translations, Pope was the finished artist. The minor poets of Pope's period included John Philips, known by his *Splendid Shilling;* John Gay, the author of the *Shepherd's Week*, and the *Fables;* Samuel Garth, the writer of the mock heroic poem of *The Dispensary;* and Richard Blackmore, who tried to restore the epic in *Prince Arthur*. Prose literature had many distinguished exponents. Jonathan Swift (1667–1745) looms up before us as a gloomy, overshadowing figure, whose saturnine genius found bitter yet powerful expression in *Gulliver's Travels*, the *Battle of the Books*, and the *Tale of a Tub*. His command of English was masterly, but his wit was coarse, his life hopelessly sad, and his death miserable. Daniel Defoe (1661–1735) was not only one of the most vigorous of political pamphleteers, but practically the father of the English novel by his *Robinson Crusoe*, a work which has surpassed almost every other in its uninterrupted popularity. Defoe invested fictitious events with an unapproachable semblance of truth. Metaphysical literature had its best representative in the philosopher, Bishop Berkeley, the founder of Idealism in English philosophy; Bernard de Mandeville unfolded a new satirical philosophy in *The Fable of the Bees*, which was intended to prove that the vices of society are the foundation of civilisation; and Bishop Butler sought to reconcile reason and revelation by his closely argumentative work, the *Analogy of Religion*. A new and interesting form of literary effort, which popularised letters and criticism, was the periodical essay, instituted by Joseph Addison (1672–1719) and Sir Richard Steele (1675–1729). The latter began the *Tatler*, which dealt in humorous and incisive fashion with the social and political life of the times. Steele was aided by Addison, and they afterwards founded the more famous *Spectator*, which was inimitable in its

humour and criticism. The *Guardian* and the *Freeholder* followed, and a higher tone was given to both literature and manners by these admirable publications. The modern newspaper had its origin in the *Public Intelligencer*, begun in August, 1663, by Sir Roger L'Estrange. The *Oxford Gazette* began in November, 1665, and the *London Gazette* on the 5th of February, 1666. Defoe, while in prison, began the publication of the *Review* (February, 1704). The drama at the close of the 17th century had, besides the greater names already mentioned, Sedley, Shadwell, Mrs. Behn, and Mrs. Centlivre, all of whose comedies, however, were licentious. Nicholas Rowe wrote heavy tragedies, which are no more likely to rise again in popularity than Addison's *Cato*. Foote, Cibber, and Fielding reproduced the follies of the times in their comedies and farces; and the *Beggar's Opera*, by Gay, produced in 1728, was the first specimen of the English ballad opera. Sentimental comedy is associated with Macklin, the Colmans, Murphy, Cumberland, and others; but the two greatest names in English comedy in the 18th century are Goldsmith and Sheridan. The delightful humour of *The Good-natured Man* and *She Stoops to Conquer* is only to be matched by the sparkling wit of the *Rivals* and the *School for Scandal*.

It has been the fashion with some critics to sneer at the 18th century, but the period from 1740 to 1800 was a very living one in English literature. Sturdy Samuel Johnson, born in 1709, began to write in 1744, and from that period until his death in 1784 he was an acknowledged leading power in letters. His *Lives of the Poets*, his *Rasselas*, *The Rambler*, and the great *Dictionary* were remarkable undertakings in various fields; while the world could afford to part with a thousand masterpieces rather than lose that immortal *Biography* by Boswell, which has enshrined his master's opinions and conversations. The *Letters of Junius* remind us of the right of criticism over public events and public men, and of the struggle by which the freedom of the press was ultimately won. The modern novel of actual life and manners dates from 1740, when Samuel Richardson published his *Pamela*, a story that was the talk and wonder of the town. It was followed by *Clarissa Harlowe*, its author's masterpiece—a book charged with pathos, and instinct with tenderness and morality. Henry Fielding, "the prose Homer of human nature," and, if not so delicate, a more powerful artist than Richardson, issued his *Joseph Andrews* in 1742, and his world-famous *Tom Jones* in 1749. Tobias Smollett wrote his *Roderick Random* in 1748, and this was followed by other stories as realistic as Fielding's, but much more marred by caricature. Laurence Sterne's *Tristram Shandy* and the *Sentimental Journey* were novelties in prose writing, and, although they are thin as novels, they will live for their peculiar wit and pathos. Goldsmith's *Vicar of Wakefield*, published in 1766, stands alone for its idyllic beauty and charming simplicity. Fanny Burney's *Evelina* and *Cecilia* (1778–1782) were noticeable for invention and observation and skill in portraiture.

The poetry of the second half of the century was varied in character, but it closed with a noble elevation in Burns. To the heavy religious poems of Blair and Young succeeded the more artistic strains of Gray and Collins and Goldsmith, and the mystical yearnings and Elizabethan fervour of Blake. Thomson, one of the most excellent of our descriptive poets, had given place to Shenstone, who had less genius but more taste, and a third writer of the Spenserian stanza was found in Beattie. Percy's *Reliques of Ancient English Poetry* brought the ballad again into favour; while Chatterton deceived the very elect by his marvellous imitation of the older forms of poetry. William Cowper (1731–1800), notwithstanding his fastidiousness and over-refinement, was a poet of a high and genuine order. He let nature have its way in such exquisite poems as the *Lines to his Mother's Picture* and the *Loss of the "Royal George,"* while any humourist might envy the delightful abandonment of *John Gilpin*. His larger poems are severer in style, yet many of their pictures, testifying to a reverent love of nature, remain imprinted on the memory; and they are full of happy phrases and turns of expression. The new life infused into Scottish poetry was heralded by Michael Bruce, a sweet singer who died at twenty-one, and by Allan Ramsay, whose pastoral drama of the *Gentle Shepherd* (1725) affords one of the most beautiful and tender pictures of Scottish rural life. The ballad acquired a new pathos and interest in such productions as Lady Anne Barnard's *Auld Robin Gray*. But the poetic genius of Scotland found its ripest and fullest expression in Robert Burns (1759–1796). His love songs have the freshness and fervour of the Elizabethan lyrics; his poems of man and of nature, like those of Cowper, reveal the highest aspirations for the welfare of humanity; his humorous compositions are as lifelike in their character-painting as they are full to overflowing of fun; and his serious poems reveal a pathos which has never been excelled. Nature seemed to put on new beauties when Robert Burns chanted her praises, and the daisy can never again seem commonplace since he immortalised it. The poor at length acquired their laureate in this sweet singer of the north.

Historical and philosophical literature attained a high level at this period. Edward Gibbon, though lacking human sympathy, had great creative power and originality, and his *Decline and Fall of the Roman Empire* is one of the most massive of historical conceptions, worked out with stately eloquence. David Hume, whose *History of England* does not take such high rank, was more original in his philosophical speculations, referring all actual knowledge to experience, and making utility the standard of virtue. Adam Smith, by his *Wealth of Nations* (1776), established his claim to be regarded as the founder of the modern system of political economy, and one of the benefactors of his species. All questions of labour and capital were placed by this work on a scientific basis, and it paved the way for the doctrine of free trade. Edmund Burke's *Reflections on the French Revolution* (1790) caused a revulsion of feeling against France, while his *Letters on a Regicide Peace*

increased the war fever in England. The former work was answered by Thomas Paine in his *Rights of Man*, and the latter by Sir James Mackintosh in his *Vindiciæ Gallicæ*. Burke's philosophical works are models of eloquence and construction. William Paley, in his *Evidences of Christianity* (1794) and other works, skilfully defended revealed religion against the attacks of its enemies. Towards the close of the century the newspaper press received a strong impetus by the establishment of *The Times* and other important journals; knowledge likewise began to be condensed and methodised in Cyclopædias; while criticism took a wider as well as a more popular range in the first decade of the present century by the foundation of the *Edinburgh* and *Quarterly Reviews*.

We cannot pass from the 18th century without noticing the remarkable development in hymnology. George Wither issued the earliest English hymn-book in 1623, *Hymns and Songs of the Church;* but the first hymn-book of the modern type was published by John Wesley for use in the Church of England in 1737. Among the hymnologists of the 18th century whose compositions remain in general use until this day may be mentioned A. M. Toplady, John Newton, the Wesleys, Isaac Watts, William Cowper, and Philip Doddridge.

The literature of the 19th century is almost overwhelming in its magnitude and variety. In nearly every branch it has attained a higher level than in the preceding century, and in nothing is this more noticeable than in poetry. Although the century opened when Crabbe, the reporter of rural life, was painting his Dutch-like pictures, we soon pass on to higher things. There was a great revival in imaginative poetry before 1820. Byron, with his precociousness in love and genius, took a high flight in his *Childe Harold*, and although all his works—*Don Juan*, *Manfred*, *Cain*, etc.,—were impressed by his own gloomy personality, he yet made living verse. Shelley, imbued with revolutionary ideas and aspirations after an ideal being, was one of the greatest poets of the age, now Miltonic in his elegiac verse in *Adonais*, and now unapproachable in his lyrics. No singer has ever drawn deeper from the wells of poetic inspiration. Wordsworth, contemplative and philosophic, the patriarch of the Lake School, taught the dependence of the poet on nature, and from the *Lyrical Ballads* to the *Excursion* he illustrated his own saying in his works, that "poetry is emotion recollected in tranquillity." He threw off the conventional, and endeavoured to pierce to the heart of things, whether in man or in nature. Fancy and imagination were made perfect in the exquisite creations and sensuous verse of Keats; wit and pathos abounded in Thomas Hood; while historic and romantic poetry found notable exemplars in Southey, Scott, Rogers, Campbell, and Coleridge. Hannah More and Joanna Baillie sought to galvanise the classical drama; Cunningham sang his Scottish songs; and Keble consecrated sacred hopes in the *Christian Year*. The historic novel was made memorable by Sir Walter Scott, whose extraordinary fecundity was the wonder of his generation. His novels were the first and greatest prose result of the revived spirit of romanticism. Jane Austen did for the domestic novel what Scott did for the historical. The pictures of English life in *Pride and Prejudice*, *Mansfield Park*, and the remaining stories by this writer, have never been excelled. Her painting of manners was exquisite, and while her characters and incidents were of the most every-day description, she lifted them out of the commonplace by her exquisite touch and her absolute truthfulness to nature.

The Victorian age may justly be called great in history, philosophy, biography, fiction, and poetry. Macaulay, in the earlier half of the Victorian period, illumined history by the brilliant glow of his imagination; while in the latter half Carlyle was not only his equal in history, but the first man of letters of his time. In his prose epic, *The French Revolution*, there was the vigour of a Rembrandt; biography was ennobled by his *Cromwell;* while throughout all his works—from *Sartor Resartus* to the latest of his utterances—he upheld the dignity of labour, and the sacredness of duty. English history in all periods, and the progress and growth of the constitution, have found brilliant chroniclers or scholarly interpreters in Hallam, Freeman, Froude, Green, Stubbs, Brewer, and Gardiner; while the philosophical aspects of history have been vividly presented by Buckle and Lecky. Rome lived again in the pages of Merivale; the Jewish race in those of Milman; and Greece in those of Grote and Thirlwall. Turning to philosophy and science, John Stuart Mill exercised a profound influence upon the age as metaphysician, logician, politician, and moralist. Charles Darwin revolutionised scientific thought by promulgating the theory of evolution, which Herbert Spencer, its most conspicuous philosophical exponent, has applied to psychology, morals, and politics. Logic and science have had other exponents in Brewster, Whately, Bain, Hugh Miller, John Tyndall, T. H. Huxley, T. G. Tait, and W. K. Clifford. John Ruskin has eloquently wedded art and morality, while biography and criticism have found representative writers in Lockhart, Forster, De Quincey, Masson, Arnold, "Christopher North," Lewes, Helps, Trevelyan, John Morley, and others whom space alone fails us to enumerate. Religious thought has been deeply impressed by Newman, Pusey, Arnold, Maurice, Robertson, Stanley, Liddon, Martineau, Gladstone, Spurgeon, and many more of all creeds.

The literature of fiction has been surprising in its growth, and practically limitless in its variety. Thackeray showed to what a pitch literary excellence and finish the novel might attain, and also demonstrated its power as a moral scourge. Dickens, the Hogarth of modern novelists, evoked smiles and tears in myriads of homes by his vivid pictures of life; and George Eliot reflected much of the sadness and unrest of the time in her searching and minutely conscientious works. Charlotte Brontë uttered a passionate note on behalf of her suffering sisters; and Mrs. Gaskell proved herself a genuine artist in the delineation of human life. Of later women writers, mention must be made of Mrs. Oliphant, Miss Braddon, Mrs. Henry Wood, and "Ouida"—all different

in style, yet all equally prolific. Marryat, James, Ainsworth, Warren, and others still find readers. Charles Kingsley struck a sympathetic human note in his fictions; Anthony Trollope was the most interesting even of all his brethren; Wilkie Collins was a master of mystery; Richard Jefferies was the interpreter of nature; Charles Reade was an intense moral reformer; George Meredith has delighted and puzzled his admirers by his brilliant powers and genius; Lord Lytton is still read for two or three of his healthiest works; and Lever and Lover for their rollicking Irish wit. It would be invidious to attempt to give a catalogue of all living novelists worthy of mention; but in addition to those already mentioned the names will occur of R. D. Blackmore, Thomas Hardy, Robert Buchanan, George Macdonald, and William Black—all widely different in their gifts and work, but all imbued with a sense of the dignity of the novelist's art. New writers of imaginative and adventurous fiction have sprung up in Hall Caine, J. M. Barrie, Rider Haggard, R. L. Stevenson, and Rudyard Kipling.

In poetry two names stand out above the rest through the Victorian age. Tennyson, the most artistic of all poets, deservedly occupies the first place from the breadth of his range. His lyrics are the finest since Shelley; his *Idylls of the King* deserve the name of epic poetry; his dramas are finely conceived; and his *In Memoriam* sums up within itself the religious aspirations of the time. Robert Browning, massive and profound in thought, is of all modern poets the most full of pith, energy, and moral aspiration. Mrs. Browning may well be called the daughter of Shakespeare, for never did poet play more divinely upon the Æolian harp of the human heart. Walter Savage Landor exhibited the classical spirit, and Matthew Arnold had an unbroken elevation in his verse. Swinburne is a master of music and rhythm, Rossetti is a perfect artist in construction, while William Morris is a Spenserian singer cast upon a later age. Among other poets of undoubted gifts are Alfred Austin, Robert Buchanan, Clough, Christina Rossetti, Coventry Patmore, and Lewis Morris. The dramas of Talfourd, Sheridan Knowles, R. H. Horne, Lord Lytton, and Sir Henry Taylor exhibited striking but widely varying merits. The minor poetic singers and writers of fugitive verse of both sexes are too numerous for particularisation.

Miscellaneous literature during the century presents several features of interest. The list of encyclopædias is worthily headed by the *Encyclopædia Britannica*, and the dictionaries by the *New English Dictionary*, and the *Dictionary of National Biography*. The education of the people has been greatly aided by the many valuable works published by Cassell's, Chambers's, and other well-known firms. Magazine literature has formed a powerful educator in itself, beginning with *Fraser* and *Blackwood*, coming down to the days of *Cornhill* and *Macmillan*, and culminating in the *Fortnightly* and *Contemporary Reviews*, and the *Nineteenth Century*. Finally, the daily and weekly press form a mighty means of communicating general information and a rapid knowledge of public events in all parts of the world, to the great mass of the community.

This brief sketch will indicate the vast extent, the all-embracing nature, and the incomparable excellence of that literature which, after the growth of twelve or thirteen centuries, now stands confessedly first among the literatures of the world.

Englishry, a term used contemptuously during the Danish rule in England to indicate the conquered people; when a murder was committed, unless a "presentment of Englishry" could be sustained, *i.e.* unless the deceased could be proved to be an Englishman, the hundred in which the murder occurred was punished.

Engraving means cutting into an object, such as a block of wood or plate of metal, so as to leave a design on the surface. This may be either for the decoration of the incised object, or for impression on some other. Engraving is limited to two processes—either cutting lines with a sharp point on a smooth surface, so that the design remains sunk; or cutting away portions of such a surface until the design is raised above it and left in relief. Both have been practised for ornamental or utilitarian purposes since the dawn of civilisation. In the British Museum one can see how palæolithic man practised the first in the caves of Dordogne; while a small porphyry object, engraved by the second process with the name of Sargon, King of Assyria in 3750 B.C., bears almost the earliest actual date at present known. In the first process, if the plate is smeared with ink and the incised lines left empty, the design will print *white;* by the second, if the block is so smeared and the parts cut away left empty, the design will print *black*.

The first process is that followed in line-engraving, sometimes known as "intaglio" or "taille-douce"; the second principally for wood-engraving. It is uncertain at what time it occurred to anybody to multiply impressions of a design engraved by one of these processes. Wood-engraving was undoubtedly the process first employed for this purpose. It is known that the practice of multiplying impressions on paper from a wood-block was carried on in China and Japan at a very early date in our era. There are in the British Museum some slips of printed prayers in Japanese which can be safely referred to the 8th century A.D. It would appear that designs were impressed on stuffs for ornament by a similar process at an early date in Europe. It is obvious that two ingredients are necessary for the proper multiplication of printed designs—viz. a permanent ink or other pigment, and a paper both strong enough to bear pressure and not too costly, like parchment, for general use. These were forthcoming in the 14th century, and wood-engraving may have been practised then; but it is not till the 15th century that any trustworthy evidence can be obtained, and it was certainly not till the middle of that century that any form of engraving for the multiplication of printed designs can be classed among the fine arts. The earliest pictorial wood-engravings were small images of saints (*Heiligen* or *Helgen*), rude in design and execution, such as are sold at church

doors or during religious festivals, and playing-cards, for which priority is sometimes claimed. The earliest print with a date, is a *Virgin with the Infant Christ and Saints* in the Royal Library at Brussels, which bears the date of 1418. This date has, however, been suspected, while the date of 1423, which appears on a print of *St. Christopher* pasted in the cover of a volume in the Althorp Library, has been universally accepted as genuine. It is probable that some existing prints of this class, undated, may be of an earlier date. Such prints were chiefly produced in Bavaria, Swabia, the Lower Rhine districts, and the Netherlands. The earliest playing-cards, however, appear to have been manufactured in France. As the practice of printing such pious subjects increased, it became usual to add explanatory or allusive texts, sometimes of great length. By engraving a number of such blocks of the same size with a series of consecutive subjects, and pasting them back to back, small volumes were formed known as "block-books," which appear to have been mainly used for the instruction of the unlearned. Among these "block-books," were the *Ars Memorandi*, *Ars Moriendi*, *Biblia Pauperum*, etc. A happy discovery led not only to the separation of the picture from the text, but also of the individual letters of the text. This invention of printing from movable types is what is generally known as the invention of PRINTING (q.v.)—perhaps the most important that the world has yet seen. Woodcut illustrations are associated with some of the earliest publications of the press. Certain prints of this date, in which the ground is shaded with a number of dots, known as the "manière criblée" or "Schrotblätter," appear to have been taken from metal blocks, engraved like wood blocks in relief.

Line-engraving for pictorial purposes has been generally supposed to have been invented not earlier than the middle of the 15th century, and to have been an accidental product of the goldsmith's craft. Recent researches have, however, shown that the works of an engraver in Germany, who is mainly known for an interesting series of playing-cards engraved on copper-plates, must be dated not later than 1430; that there is no reason to suppose that this engraver was the discoverer of the art; and that other copper-plate engravers in Germany trod closely on his footsteps, a series of small engravings of the *Passion* (in the print-room at Berlin) being dated 1446. Copper-plate engraving also first brings the art of engraving to rank among the fine arts, through the works of an engraver, who is only known by his initials "E. S." and the dates 1466-1467, which appear on some of his later prints. His works show not only great technical skill, but great beauty of design and intensity of conception.

Such engravings as these were mainly executed with a stiff, sharp instrument, known as the "burin," which ploughed a line in the copper: some of them, however, show the use of a finer, needle-shaped instrument, known in later days as the "dry point." The earliest exponent of this latter method was an anonymous engraver, who lived before and about 1480, and is known as the "Meister des Hausbuch." The bulk of this artist's engravings, which are sometimes extremely realistic in conception, are preserved in the national collection at Amsterdam. The first great personality in the history of engraving is Martin Schongauer (born at Colmar in Alsace about 1450, died at Mülhausen, 1491), who was both painter and engraver. His works are not only technically perfect, but are full of poetical and religious inspiration, though trammelled by the stiffness of design prevalent at that date. His immediate successor was Albrecht Dürer of Nuremberg (1471–1528). The popularity of these early engravings is illustrated by the fact that the works of two of the most prolific engravers at this date, Wenzel von Olmütz and Israhel van Meckenem, consist almost entirely of copies from the most important engravings from the master "E.S." down to the early works of Dürer. By Dürer (q.v.) the art of engraving was advanced to a very great degree. He, too, was the first to practise for pictorial purposes the art of *Etching*, whereby the work of the graver was effected by the action of a corrosive acid, a process long practised by armourers for decorative purposes in their craft. Wood-engraving, too, flourished under Dürer. It is almost certain that Dürer and other great artists did not habitually cut the wood-block themselves, and that the wood-engraver remained for a long time a mere mechanical craftsman. This art came about 1490 to the fore by the employment for the first time of first-rate artists as designers. The chief result of this was a folio book giving a chronicle of the world's history, published at Nuremberg in 1492 by Hartmann Schedel, and known as *The Nuremberg Chronicle*, for which the illustrations were drawn by Michel Wolgemut, the master of Dürer, and W. Pleydenwurff, both painters of note at Nuremberg. Unfortunately the want of skill in the engravers destroyed much of the beauty of the original drawings, as may be seen by comparing the engraved frontispiece to the book with the original drawing for the same, which is preserved in the British Museum. Under Dürer a better class of engravers rose. Italy for a long time claimed the honour of the invention of copper-plate engraving. According to tradition one Maso Finiguerra, a goldsmith at Florence, while working in 1452 on an engraved "Pax," ornamented with niello [NIELLO], discovered by accident that lines hollowed out of a metal plate and filled with black pigment would give an impression on a white surface, and thus executed a beautiful print from a "Pax," which is now at Florence, of which there is an impression in the National Library at Paris. That Finiguerra discovered how to take impressions on paper from niello plates during the progress of their execution need not be doubted, as many prints exist taken from such plates. It has been shown, however, that copper-plate engraving was already in full practice many years before Finiguerra's discovery. Moreover, niello plates were for ornament, and not to be used in printing, so that all impressions from true niello plates should have the design in reverse, since for the purposes of printing all designs are engraved in reverse on the plate or block itself. It is not till 1480 that an Italian school of engraving can be said to have existed. About that time a few

engravers practised at Florence, obviously from the designs of Botticelli, Filippo Lippi, Pollaiuolo, and other great Florentine artists, who in some cases are credited with having practised the art with their own hands. These Italian prints show as great technical excellence and a great deal more beauty of form and design than those of the contemporary engravers in Germany, but there are distinct traces of northern influence in some of the early Italian prints. The earlier Italian engravings, such as the illustrations to the *Dante* of 1481, the *Prophets and Sibyls*, the *Tarocchi Cards*, etc., have been roughly classed under the name of a possible, but unauthenticated engraver, Baccio Baldini. One of the great painters who practised engraving himself was Andrea Mantegna, who has left some important works in copper-plate engraving, executed in a peculiarly powerful and individual manner. The art was practised by other well-known artists, such as G. Mocetto, the Campagnolas, the Francias, among whom perhaps the most interesting is Jacopo de Barbari, who was a native of Venice, but lived for some time in Germany, and was also in the royal service in the Netherlands. Barbari was a strong individual genius, even strong enough to have a powerful influence on the ripening mind of Dürer. Copper-plate engraving in Italy reached its highest point in Marc Antonio Raimondi, whose first public appearance was as a pirate of engravings by Dürer, but who attained higher renown as an exponent and translator of drawings and paintings by Raphael, Giulio Romano, Bandinelli, and others. Marc Antonio inaugurated a school of engraving of great excellence, among his followers being Agostino Veneziano, J. Caraglio, the Ghisi and Scultore families, Marco Dente of Ravenna, Giulio Bonasone, Enea Vico, and others. It was during this period that the engraver's art began to be employed for the most part in reproducing the drawings or paintings of other artists. The facility with which well-known works of art could thus be circulated and made accessible to the multitude caused this practice to be developed to an unlimited extent in subsequent ages, so that at the present day there are many who believe this to be the sole and original aim of the engraver.

Wood engraving as an art was introduced into Italy in connection with the printing-press by German artists in 1465 with considerable success.

In the Netherlands, where wood-engraving, as stated before, was practised at an early date, copper-plate engraving found its first great exponent in Lucas van Leyden, who commenced engraving in his boyhood, and produced a great number of engravings, which are pre-eminent for delicateness of execution, wealth of imagination, and the realism, which has always characterised the art of the Low Countries. Like Dürer, Lucas van Leyden, though distinguished as a painter, found the true outlet for genius in the art of engraving.

One mode of engraving popular at this date, for the inventor of which Germany and Italy contend, was that of chiaroscuro (*camaieu*), wherein by superimposition of two or more wood-blocks, smeared with different colours, the effect of a coloured engraving was produced. This was much in vogue in Italy in the 16th century, but then died out, and after a few attempts to resuscitate it at later dates, the principle was adopted and carried to great perfection in our modern chromolithography. In Germany the influence of Dürer was widely felt in all branches of engraving. At Nuremberg a school of engravers was formed, who are known as the "Little Masters," owing to the very small size of their engravings. This minuteness, which led to the exercise of very remarkable skill, was due to the fact that the goldsmiths and armourers had recourse to engravers for models of ornament with which to decorate their manifold productions. These "Little Masters" were Hans Sebald and Barthel Beham, H. Aldegrever, A. Altdorfer, J. Binck, G. Pencz, and Virgil Solis. The school of Dürer also produced excellent engravers in Augustin Hirschvogel, Hans Ladenspelder, etc. Wood-engraving, too, flourished greatly, being carried on in the Dürer manner by Hans Schäufelein, Hans Springinklee, and others at Nuremberg, and at Augsburg by Hans Burgkmair. Augsburg became one of the principal centres of engraving under the auspices of the art-loving Emperor Maximilian, to whose munificence are due such great productions in wood-engraving as *The Triumphal Arch* by Dürer, the illustrations to *Theuerdanckh* by Schäufelein, the *Weiss Kunig*, and *The Triumph of Maximilian* by Burgkmair and others. From Augsburg also came the Hopfer family, who practised the art of etching with great success. Saxony produced a great and original artist in Lucas Cranach, equally distinguished as painter, engraver, and draughtsman on wood.

In Switzerland a school of engravers grew up, who practised principally at Basle, chiefly in connection with the printing press, and many notable works in engraving were produced by Urse Graf, Nicolas Manuel Deutsch, and others, including Hans Holbein the Younger, whose designs for the Bible and the *Dance of Death*, as cut on the wood by Hans Lützelburger, remain perhaps to this day the high-water mark of engraving. Subsequently, the art of engraving grew weaker throughout Germany along with a general decay of artistic impulse, and it was chiefly confined to interests of a servile and commercial nature of little artistic value. The engravings of Cranach and Holbein had a large share in preparing the minds of the uneducated classes for the new era of the Reformation.

In Italy the school of Marc Antonio was succeeded by a number of artists who practised engraving, especially etching, with extreme facility and frequent beauty of execution. The shallow grace and feeble conceptions of the Carracci, Guido Reni, Parmigiano, Primaticcio, and their contemporaries were strongly shown in the engravings of their school. Under their influence the art of engraving ripened rapidly, withered, and then sank to almost complete extinction. When Germany and Italy failed to maintain the art of engraving at its former excellence, the other countries took their place. Foremost among these come the Netherlands.

At Antwerp the family of Wierix carried on the Dürer tradition with great skill. They and their

successors, the Galle family, the Collaerts, and others, formed a large school, whose technical abilities were exercised most prolifically on the countless designs of a religious nature commanded and circulated by the Jesuits not only in Europe, but in all parts of the inhabited world. As in the days of the Reformation mentioned above, engraving became a language through which to reach the minds of the uneducated. At Antwerp also a school of first-rate engravers sprang up, mainly devoted to the translation of pictures by Rubens (under his immediate supervision), Van Dyck, and their immediate followers; noteworthy among these were Scheltius and Boetius van Bolswert, Paulus Pontius, and Lucas Vorsterman the elder. Engraving became at this time extensively practised throughout the Netherlands, and nearly every town supported one or more engravers of eminence. Holland produced first-rate artists in Hendrik Goltzius, Jan Muller, J. Saenredam, the Matham family, Cornelis and Jan Visscher, J. Suyderhoef, the Van de Passe family (who worked Utrecht and Cologne), and others. It was in etching, however, that the Netherlands attained their greatest eminence. The few untouched etchings left by Van Dyck are models of invention and refinement. Rembrandt van Ryn (q.v.) carried both painting and etching to the highest point: his etchings are among the art-treasures of the world.

Holland produced at the same time as Rembrandt, in an almost bewildering number, original exponents of the art of etching, some of whom—such as Adrien van Ostade, Paul Potter, N. Berchem, J. Livens, Carel du Jardin, with many others—are worthy of being classed in the first rank. By the end of the 17th century the supply ceased, and from that date few works of interest were produced in the Netherlands, where, as in other countries, the art of engraving was limited to the mere illustration of books or to producing of cheap copies of popular works of art. Bernard Picart, a Frenchman, established a large business at Amsterdam in the 18th century, whence countless engravings of this class were issued. Jacob Houbraken is well known for his numerous engravings of portraits, executed from originals in England. Wood-engraving became largely employed for advertisements, cuts in newspapers, etc., usually on a small scale.

In France the art of engraving was acclimatised with some difficulty. At the end of the 15th century wood-engraving had been introduced in connection with the printing-press, and the books issued by the publishers Simon Vostre, Antoine Vérard, and others were adorned in a very beautiful way with small cuts, executed in the dot manner (*manière criblée*), and engraved in relief on blocks of metal. Wood-engraving never really flourished in France, the most noteworthy examples being the engravings from the designs of Bernard Salomon ("le petit Bernard"), published at Lyons during the latter half of the 16th century.

Copper-plate engraving was practised in France early in the 16th century by Geoffroy Tory, Jean Duvet, Jean Cousin, Jean de Gourmont, and others, but without giving much impulse to the art. Some engravers like Nicolas Beatrizet and Niccolo della Casa went to Italy, and wasted their skill under the Italian influence of the decadence, and the same influence was exercised on a school of artists at Fontainebleau. A school of engravers at Paris based themselves on the tradition of the Wierix family at Antwerp, and certain engravers like Thomas de Leu and Leonard Gaultier showed great technical excellence, especially in the engraving of portraits. Goldsmiths profited largely from the engravings of Étienne Delaune, who worked in a style similar to that of the "little masters" in Germany, of Pierre Woeiriot and a few others. With the 17th century engraving in France began not only to be very widely practised and patronised, but also to develop that peculiar technical skill, especially in the rendering of portraits and pictures, which for the next hundred and fifty years made Paris the centre of the engraver's art. Pierre Daret and Michel Lasne were the inaugurators of this period, with Claude Mellan, who endeavoured to reduce the labour in the process of engraving by confining himself to the contours of a single line, in which manner he produced some remarkable achievements in engraving, but found few, if any, imitators. Abraham Bosse, who wrote a treatise on engraving, showed himself technically a master of his art. Jacques Callot is, perhaps, the first great original painter-engraver in France, though much of his life was passed in Italy. Both in line-engraving and etching he produced an immense number of engravings, many on a very minute scale, the popularity of which has been maintained to the present day. Stefano della Bella, whose numerous etchings show a light and dexterous touch, though a native of Italy, passed a great part of his life in France. Another great artist, who worked in both countries, was Claude Gelée (Lorraine), whose etchings contain something of the glamour which is found in his paintings, and who found many imitators in his Italianised style of landscape-etching. During the long reign of Louis XIV. Paris was crowded with engravers of great merit chiefly occupied in translating the paintings of the great French painters. Among them were the Audran family, G. Edelinck, F. de Poilly, and many others.

The engraving of portraits was carried at this time to great perfection, the portraits of the period lending themselves handsomely to the burin of R. Nanteuil, J. Morin, A. Masson, the Drevets, and P. van Schuppen. Towards the end of the century the prevailing exuberance of taste in ornament produced a great number of engravings devoted to that purpose from the designs of J. Berain, J. Le Pautre, etc. The 18th century found engraving still flourishing in France, large schools of engraving being formed in Paris under J. P. Le Bas, P. F. Basan, and other well-known engravers, who issued numerons publications containing engravings from the pictures in the great private galleries of royalty and the nobility. Watteau, Lancret, and the "galant" painters of the reign of Louis XV., gave occupation to engravers whose admirable skill was often wasted on the frivolity and questionable nature of their subjects. Book-illustration and ornament also became one of the features of the time, the publishers vying among themselves to

secure the ablest engravers to reproduce the exquisite book-plates and vignettes of Eisen and Gravelot. Among the engravers of this class may be noted J. M. Moreau and P. Choffard.

New methods of engraving were invented about this time. Colour-printing, which had been extinct since the days of the old chiaroscuro engraver, was revived with the employment of mezzotint engraving by J. C. Le Blon and carried on by his pupils for a time, but without much success. A more successful method was adopted by Bonnet, Janinet, Descourtis, and others, and carried to perfection in later days by L. P. Debucourt, whereby some delicate and agreeable engravings in colour were produced, which are highly valued by connoisseurs. Demarteau invented a process of engraving in colours to imitate chalk-drawings, and J. B. Leprince was the first to practise aquatinta or lavis engraving, which afterwards proved so useful for topographical purposes. Line-engraving during the 18th century in Paris was usually based on a groundwork of etching.

In England copperplate-engraving was practised in the 16th century by a few foreigners and one or two native engravers, dating from the early years of the reign of Queen Elizabeth. Archbishop Parker was the first in England to give regular employment to engravers, who were mainly employed on topographical work and portraits. In the reign of James I. two members of the Van de Passe family came over from Utrecht and worked at portraits, having various imitators such as R. Elstracke and F. Delaram. Subsequently the art of such engravers as William Marshall and T. Cecil was almost entirely employed on frontispieces and illustrations of books. Wenzel Hollar, a Bohemian by birth, executed a great part of his numerous etchings in London, and he left a few pupils, such as R. Gaywood, who imitated his method, but with indifferent success. The first great native engraver in England was William Faithorne, who, however, derived some of his skill from his training in France under Nanteuil. The middle of the 17th century was remarkable for the invention of mezzotint engraving [MEZZOTINT ENGRAVING], which, although invented by Ludwig von Siegen in Germany in 1642, was not really developed until its introduction into England by Prince Rupert, who with Wallerant Vaillant, A. Blooteling, and a few English artists brought it to perfection and to such popularity that it became known as the "English manner." This process was chiefly devoted to portraits, and countless portraits by Lely, Kneller, and their contemporaries have been thus preserved to posterity. For a time mezzotint-engraving rather superseded line-engraving, but David Loggan engraved many important works in topography and in portraiture, and in the latter line was ably followed by his pupil, Robert White. G. Vertue at the beginning of the 18th century was a prolific engraver of portraits, topography, antiquities, etc., and was followed by the Basires and other engravers of a formal and uninteresting nature. William Hogarth engraved many of his own compositions in a somewhat dry manner, but with great technical excellence. A more distinctly national impulse was given to engraving by the works of Sir Robert Strange, William Sharp, and William Woollett, whose technical skill was of the highest order. They were followed by a group of landscape engravers including F. Vivares, J. Browne, J. Mason, etc. Engraving was demanded very extensively for book illustrations, historical pictures, and the like; but the style of the English line engravers at the close of the 18th century became monotonous and conventional, and their works excite but little enthusiasm. Much greater attention was drawn to the newly-developed art of stipple-engraving, of which F. Bartolozzi was the chief exponent, and the sweet but vapid designs of Angelica Kauffmann, G. B. Cipriani, and R. Cosway were the principal subjects.

Mezzotint engraving was brought to a high pitch of perfection under Sir Joshua Reynolds, many portraits painted by him being engraved by this process. McArdell, J. R. Smith, Valentine Green, R. Earlom, W. Dickinson, were among the most noteworthy engravers at this date.

Early in the 19th century a new impulse was given to line-engraving in Italy, a school of engravers in the pure line manner being formed at Rome by Volpato and Raphael Morghen, who engraved many of the best works of the old masters; a similar school was established under P. Toschi at Parma, devoted to engraving the works of Correggio, and their influence spread to Germany, where many similar engravings were produced. Technically the engravings of this date are of the highest excellence, but, being monumental in their nature, they are to a certain extent cold and unattractive. In England the discovery of covering the copperplate after engraving with a light coating of steel, gave for a time a great impulse to the art of engraving, since the number of impressions, which can be taken from a steel plate with but slight variations of excellence, is almost unlimited. For a time books illustrated with engravings of this kind were greatly in vogue, but latterly the line-engraver has been almost entirely occupied in reproducing on a large scale the works of contemporary and popular artists. J. M. W. Turner in his *Liber Studiorum* combined etching and mezzotint, and many fine engravings were made by other engravers from his paintings. D. Lucas produced some fine mezzotint-engravings from paintings by J. Constable, under the painter's immediate supervision. Sir Edwin Landseer owed much of his popularity to the skill of his brother, Thomas Landseer, as an engraver. The introduction of photography, and the various processes resulting from it, gave, to a certain extent, a death-blow to engraving everywhere. Mezzotint engraving almost entirely perished, though a few attempts to revive it have been made at the present day. Etching, on other hand, was revived in France as an original art with great success by C. Méryon, Bracquemond, Lalanne, and other artists of note. The impulse thus given by them reached England and even America, the chief exponents of the art in the former country being Seymour Haden and J. McNeil Whistler, under whose influence the art has fought its way into the front rank.

Wood-engraving also in the 19th century took a fresh lease of life under Thomas Bewick of Newcastle, who abandoned the old process of engraving in relief for a form of intaglio engraving in wood, which has been adopted extensively throughout the world, and with which his name is inseparably connected. To his process of wood-engraving is due the illustration of newspapers and periodicals, so widely prevalent at the present day. Lithography cannot strictly be classed as a process of engraving, though used for printing in a similar way. When the Royal Academy was founded, engravers were admitted into the ranks of the academicians. At the present day, however, the art of engraving, with the exception of etching, has too far ceased to be concerned with original production, and is not sufficiently free from mechanical assistance, to enable it to maintain its position among the fine arts.

Engrossing, the fair copying of a deed or other instrument for execution, words and figures being written in full. As regards conveyances and other documents relating to freehold lands and probates of wills, **the old style of engrossing** is largely retained, though it is not now compulsory, and it is rapidly giving way to the ordinary handwritings. [DEED.] In criminal law engrossing was the offence of buying up large quantities of corn, etc., with intent to resell. It was abolished by a statute passed early in the present reign. In the United States it is a common law offence.

Enlisting is an engagement or undertaking to serve as a private soldier or sailor, either for an indefinite time, or for a certain fixed time, on receipt of pay therefor. It is voluntary, and in that respect differs from enrolment, which is compulsory, or at least is so under some circumstances, as in the case of men who are selected by ballot for the Militia, or by the conscription for military service on the Continent. The statutes which at present regulate the enlistment, etc., of soldiers, are the 42 & 43 Vict. c. 33, amended by the "Regulation of the Forces Act, 1881," and repealed and re-enacted with amendments by the "Army Act, 1881," which last statute is directed to come into force during the continuance of an annual Act to be passed for that purpose, but for no longer period; and to be subject, moreover (when so brought into force), to such provisions as may be specified or referred to in the annual Act. In this military code provision is made for the manner in which the troops are to be enlisted, and "billeted"—*i.e.* dispersed among the several innkeepers and victuallers throughout the kingdom, and regulations are therein laid down for the government of the Army, and for every person subject to military law. As to sailors, the practice is closely analogous to that established for the government of the Army—the scheme of naval discipline (comprised in what are known as "The Articles of the Navy"), was embodied in a statute of Geo. II. (amended by subsequent Acts), and is now laid down in the "Naval Discipline Act, 1866," which is, like its predecessors, permanent in its character, and does not require (as in the case of the Army) to be brought into force by an annual Act. This curious distinction probably arose from the perpetual establishment of the Navy, which rendered a permanent law for its regulation expedient as against the temporary duration of the army.

Enniskillen, a market town, and previous to 1885 a parliamentary borough, in the county of Fermanagh, Ireland, 34 miles N.E. of Sligo, on an island in the river that joins Upper and Lower Loch Erne, having a suburb upon each bank, to which it is joined by two bridges. The principal industries are tanning and brewing, and there is considerable trade. The town gives its name to a regiment of dragoons.

Ennius, QUINTUS (239–169 B.C.), a Latin poet, born at Brundisium. Cato the Censor brought him to Rome at the mature age of 38, and here he gained the friendship of the leading men and taught Greek. To a knowledge of Greek he added a thorough acquaintance with Oscan and Latin, and his writings seem to have helped to fix the Latin tongue. In another way he was the Spenser of Rome, for he was a "poets' poet," and the affectionate epithet applied to him was "Ennius noster." Of his many writings—epic, comedy, tragedy, annals, etc.—only fragments remain.

Enns, a river of Austria rising in a branch of the Noric Alps in Salzburg, 12 miles N. of Ratstadt. It flows N. to Ratstadt, then N.E. across Styria and N.W. into Austria, which it divides into Upper and Lower, and falls into the Danube, somewhat below the town of Enns, after a course of 160 miles, the lower part of which is navigable.

Ensign, a word formerly used in the English army to denote a junior rank of commissioned officers in an infantry regiment, one of whose duties was to carry the Queen's and the Regimental colours. The name is now abolished, and the title of second lieutenant substituted for it. In naval phraseology the ensign is the national flag, which is exhibited at the stern of a vessel. Both officer and flag were formerly called "ancient"; and this word is used in Shakespeare to denote the officer, and in old books of travel to denote the flag.

Enstatite, one of the "rhombic pyroxenes," silicates of iron and magnesia related to augite (q.v.), but crystallising in the Rhombic (*i.e.* Prismatic) system. They differ in the percentage of iron they contain, Enstatite having less than five per cent. In thin sections it is colourless and not pleochroic. It gives its name to varieties of diorite and dolerite. It is slightly pearly in lustre, almost infusible, has a hardness of 5·5, and a specific gravity of 3·1 to 3·3.

Entablature, in *Architecture*, continuous work resting upon columns, and sometimes consisting of architrave, frieze, and cornice.

Entail. [ESTATE-TAIL.]

Entalophoridæ, a family of Bryozoa, belonging to the order Cyclostomata (q.v.), and including a number of forms with erect, branching shoot-like colonies with the separate polypides or individuals of the colony opening on all sides of the axis.

Entellus (*Semnopithecus entellus*), a monkey highly venerated by the Hindoos. [HANUMAN.] It is naturally confined to the right banks of the Ganges and Hooghly, but has been introduced elsewhere by the natives. It is of large size, with the tail longer than the body, ashy-grey above, dingy yellow below, the tints deepening with age. The dusky face has a fringe of white hairs. Like some other monkeys, it is reverenced as a possible host of ancestral souls, and on that account is allowed to commit depredations unchecked.

Enteric Fever. [TYPHOID.]

Enteritis, acute inflammation of the intestines, may be caused by mechanical injury or by the ingestion of irritating substances; again it usually complicates such diseased conditions as exist in strangulated hernia, intussusception, and other forms of intestinal obstruction. [INTESTINES.]

Enterocœle, one of the best-known types of body cavity (q.v.); it is formed from an outgrowth from the primitive cavity in the larva. It occurs in the Echinodermata, Brachiopoda, *Sagitta*, *Balanoglossus*, and *Amphioxus*.

Enteropneusta, the class of worms which includes *Balanoglossus*, a genus well known in connection with the speculations as to the ancestry of the Vertebrates. The characters of the group are given under BALANOGLOSSUS.

Entomostraca, one of the two sub-classes of the class Crustacea, including small and simply organised forms, in which the number of somites and appendages is very variable, whereas in the Malacostraca (q.v.) the number of somites is always 19. There are four orders of Entomostraca—(1) the Phyllopods, with elongated, segmented bodies, protected by a shell; (2) the Ostracods, small unsegmented forms with bivalved shells; (3) the Copepods, long and segmented but shell-less; and (4) the Cirripedia, including the fixed, imperfectly segmented barnacles and acorn shells. The Entomostraca are mainly marine, but many of the Phyllopods as *Daphnia* and *Apus*, of the Ostracods as *Cypris*, and of the Copepods as *Cyclops*, are fresh-water; *Estheria*, a Phyllopod, is estuarine. The sub-class commences in the Lower Silurian. Reference should be made for further particulars to each of the four orders.

Entoprocta, a sub-class of Bryozoa (q.v.), including the four genera *Loxosoma*, *Pedicellina*, *Ascopodaria*, and *Urnatella*, and possibly also *Barentsia*. They are by far the simplest class of the Bryozoa, and even the adults are really in the stage of the larval form, known as the Trochosphere (q.v.). They have no body cavity, have one pair of nephridia or renal organs, and the sexes are united in the same individual The main character of the class, however, is that the anus and mouth are both included within the circlet of arms. No fossil representative of the class is known.

Entozoa, a term once used to include those worms which are internal parasites, such as the Flukes, Tapeworms, Hair Worms, etc. As, however, the adoption of this division necessitated the division of such a class as the Nematoids or threadworms, it has been abandoned. [FLUKE, TAPEWORM, ACANTHOCEPHALA, and NEMATOIDEA.]

Entre Douro e Minho, or MINHO, a province in the N.W. of Portugal, having the Minho on the N. and the Douro on the S., with an area of 2,800 square miles. There are three districts—Braga, Viana, and Oporto, the last being the capital and the port from which the wine of the district is shipped. The province also produces oil, flax, cereals, and vegetables, and the fisheries of the coast are important.

Entrenchments, a term of military engineering used to denote a set of defences and protections of a force, formed. as the name implies, by excavating the ground and serving both as an obstacle to the enemy's advance and. if necessary, as cover and protection for the defenders. When used as a covered approach to a place besieged, the excavations made are commonly called "trenches."

Entre Rios (*between rivers*) is a province of the Argentine republic between the Uruguay in the E. and the Parana in the W. and S., and having the province of Corrientes to the N. It contains about 45,000 sqnare miles, and consists in the southern part of a low-lying, alluvial plain, subject to inundation, and in the northern of undulating land with large swamps covered with small timber, but containing fine grass and pasture lands, and occupied by estancias (farms), which rear about four million horned cattle. The climate is good, but there is little cultivation. There are many tributaries of the two rivers mentioned above. The chief productions are hides, horn, tallow, and charqui (jerked or dried beef). Concepcion is the capital.

Entropion, or ENTROPIUM, a turning-in of the edge of the eyelid. due to muscular spasm. or to cicatricial contraction supervening upon a wound of eyelid. In entropion the eyelashes are turned inward, and, rubbing against the cornea, produce intense irritation. The condition if neglected may lead to considerable loss of vision.

Entropy, in the theory of heat, is a special property of the heat in a body. It measures that part of the energy in the body or system of bodies which cannot be converted into work, though it is not identical with the unavailable energy. In every heat transfer from bodies at higher temperatures to bodies at lower. the available energy is diminished and the entropy increased. In all such transfers the entropy tends to a maximum. [HEAT, ENERGY.]

Envelope, in *Geometry*, means the line or surface formed by small portions of a series of curves or curved surfaces, such that if a point travels along the line or surface, it will at any instant be travelling tangentially to one of the series. If a great number of equal circles be drawn all passing through one point, their envelope will be a circle of double the linear dimensions and with its centre at the given point. Or if a great number of straight lines be drawn in a plane, all

at the same distance from a given point in it, they will envelope a circle with that point as centre.

Envelopes, in a technical sense, are the covers used to protect letters sent by post or otherwise, to secure them from observation. Till comparatively lately the envelope was unknown, a letter being written upon a sheet, whose outside was left blank and which was folded over so as to form a space for the address. The post office sells envelopes with embossed stamps upon them. Among the early designs was the Mulready envelope, which is now an object of curiosity for collectors. New varieties of envelope are frequent.

Environment, a convenient collective term employed in biology for the conditions of existence, or inanimate and animate surroundings, among which an organism lives. The opinion is gaining ground that this environment has had a leading influence in producing adaptive modifications of organisms by its direct actions. Geoffrey St. Hilaire in 1795 and Lamarck (q.v.) in 1801 attributed much to what the former termed "*le monde ambiant*," as did Robert Chambers in the *Vestiges of Creation* (1844). Mr. Herbert Spencer has always done so; but Darwin at first laid far more stress on inherent variability. Drs. August Weismann and Karl Semper have since insisted on the paramount influence of the environment on animals, as has the Rev. George Henslow in the case of plants. Food, light, temperature, movement and salinity of water, dryness or moisture of the air, among inorganic influences, and the action of parasites (q.v.) or of similar competing organisms, among those that are organic, contribute to this environment. The absence of colour in cave animals and its uniformity in other cases, as in the "sabelline" or sandy hue of desert animals, have been attributed to the direct action of the environment. "Melanic," or dark, varieties are said to be connected with increased atmospheric moisture; even the origin of flowers is explained by the response of the plant to mechanical irritation by insects.

Envoy, a public minister sent upon some special business from one government or ruler to another. He thus differs from the ambassador, who permanently resides at the foreign court.

Eocene System, the lowest subdivision of the Tertiary group of sedimentary rocks, so named by Lyell (from the Greek *ēōs*, dawn; *kainŏs*, recent), because the mollusks in these rocks present the first specific approximation to those of recent times. From the Mediterranean basin to what are now the Pyrenees, Alps, Carpathians, and Caucasus, through Syria, Northern India, China, and Japan, open-sea conditions continued after the close of the Cretaceous (q.v.) epoch, and a massive limestone crowded with the characteristic foraminifer *Nummulites* (q.v.) was laid down. In Northern Europe the bed of the Chalk sea was raised so as to form several more or less distinct areas of deposit, and the outpourings of the great basalts of Auvergne, the Eifel, Antrim, Mull, Skye, and Iceland probably began. In Britain Eocene rocks are confined to the two centroclinal basins in the Chalk, known as the London and Hampshire Basins. Paris is situated on a similar basin. Both the plants and the animals they contain point to a climate almost tropical. Palms, nautili, cone, volute and olive shells, turtles, crocodiles, and sea-snakes indicate this. Besides sharks and a few birds, Eocene beds have yielded a variety of mammalian remains, especially interesting from their generalised character, combining, as they do, features of various groups now distinct. Such are the Tillodontia (q.v.) and *Eohippus*, the small ancestor of the horse, from the western United States, the tapir-like *Palæotherium* of Europe and the lemuroid *Cænopithecus*. The British Eocenes may be divided as follows:—

	Hampshire.	London Basin.
Upper—	Barton Clay.	Upper Bagshot Sands.
Middle—	Bracklesham, Bournemouth, and Alum Bay beds.	Middle Bagshot Sands. Lower Bagshot Sands.
Lower—	Bognor Clay.	London Sands. London Clay.
	Woolwich and Reading Clay.	Woolwich and Reading Clay. Thanet Sands.

The lignites associated with pipe-clay in an old lake-basin at Bovey Tracey in Devonshire, and some at least of those between the great basalt sheets, 900 feet thick in Antrim, 3,000 feet thick in Mull, and extending into Greenland, are assigned to this period. [Bagshot Sands, London Clay, Thanet Sands.]

Eocystites, an obscure genus of Cystoids (q.v.) found in the Lower Cambrian rocks; it is of interest as the oldest known Echinoderm.

Eon de Beaumont, Charles (1728–1810), a French adventurer, sometimes known as the Chevalier d'Eon. Having attracted notice as a political writer he was sent on a secret mission by Louis XV. to St. Petersburg, where, disguised as a woman, he obtained much influence over the Empress Elizabeth, and advanced the views of the French Court. The next year he returned to St. Petersburg in man's dress, and professed to be the brother of his former self. He did other diplomatic work, and after a period of service in the army he was appointed Minister to the British Court. Falling into disgrace at the French Court, and being superseded and outlawed, he resided in England, where people were much exercised as to his sex, and in an action arising out of a bet the Court of King's Bench ruled that he was a woman. For a time he went back to France on condition of wearing woman's attire. He died in London.

Eoscorpius, a primitive type of Scorpion found in the Carboniferous rocks of Europe and America.

Eosin ($C_{20}H_8Bi_4O_5$) (*Tetra-brom-fluorescein*), a bronze-coloured powder, which yields a fine red solution, and is the starting-point of a series of fine dyestuffs—the Eosin Dyes.

Eötvös, Josef (1813–1872), Hungarian statesman and author, was born at Ofen. He studied philosophy and law at the University of Pesth, and before 1831 had produced three dramas, one of which was a tragedy. He practised law for a short time, and then travelled in many countries of

Europe, and wrote upon prison reform in 1838. He formed a friendship with Kossuth, and became known as a journalist, and in the Diet. After the Revolution of 1848 he was Minister of Public Instruction under Batthyany, but he resigned and retired to Munich for three years. In 1851 he returned to Hungary, and in 1855 became Vice-President and in 1866 President of the Hungarian Academy. In 1867 he was again Minister of Public Instruction. A collection of his political writings was published in Leipzig in 1846. He also wrote some novels, *The Carthusian*, *The Village Notary*, and *Hungary in 1514*.

Eozoon, or the "DAWN ANIMALCULE," is a structure which often occurs where thin alternate layers of serpentinous and calcareous minerals are superposed and have been subjected to alteration. The interest and importance of this structure is that it was originally described as a fossil; and, as it occurs in a series of rocks probably of igneous origin, below the base of the lowest known sedimentary rocks, it was claimed as the earliest sign of life on the earth. It has thus attracted great attention, and an enormous literature has been devoted to it.

1. *The discovery.* It was first found in Canada, associated with the crystalline and igneous rocks assigned to the Lower Laurentian system, and was described in 1864 by Sir W. Logan, Sir J. W. Dawson, and Dr. Carpenter as a great Foraminifer (q.v.). It was found in many places in Canada, while a similar structure occurs among similar serpentinous rocks in Connemara, Skye, Bohemia, Bavaria, Trinidad, etc.

2. *The theory of its organic nature.* The typical specimens consist of irregular layers of some calcareous mineral (calcite or dolomite), separated by serpentine usually occurring as a series of rounded bodies. The former was regarded as the "intermediate skeleton" of a Foraminifer, while the serpentine was regarded as due to infiltration of the body cavities. The calcareous layer is usually traversed by a series of branching fibres, etc., which were regarded as casts of the canals which ramify through the skeleton of the higher foraminifera, such as the Nummulites; occasionally simple, short, and thicker bands or rods connect two calcareous layers; and these were compared to the "stolon passages," which connect adjacent body cavities of the Foraminifera. The serpentinous layers are often bordered by a narrow fibrous zone, which appears as if composed of innumerable minute tubes, and has thus been identified as the "nummuline layer" or proper wall. Dr. Carpenter admitted that each of these four structures can be matched among minerals, but he maintained that the association of the four proved an organic origin. Eozoon was, therefore, claimed as the remains of a gigantic Foraminifer, which lived at the bottom of the Laurentian sea, and was the oldest known fossil.

3. *The arguments for its inorganic nature* are twofold; in the first place, it occurs in rocks which were either formed directly by the consolidation of a molten mass or by the intense metamorphism of other rocks; in the former case, no living being could have existed at the time of the formation of the rocks, and in the latter any fossils would inevitably have been destroyed. The *à priori* improbability of the discovery of fossils in these rocks is, therefore, very considerable. In the second place, it is maintained that all the structures present can be matched elsewhere in rocks, which are clearly inorganic, while they are really quite different from the Foraminiferal structures with which they have been compared. Thus, the supposed proper wall is merely a layer of chrysolite (a variety of serpentine), which is formed on the surface of the serpentine layers; the supposed canals appear to be dendritic minerals included in the limestone, while in the specimens selected by Dr. Carpenter as especially typical they have been shown to differ fundamentally in form, nature, and position from any possible organic canals. It, therefore, appears that the Eozoonal structure is due to the interlamination of some mineral which becomes altered to serpentine with layers of limestone. This might be caused either by the original deposition of grains of olivine in a limestone or by the formation of a zonal structure in an intensely altered limestone. One very weighty argument against the theory of the organic origin of Eozoon is that it is never found in ordinary limestones or clays, but always in association with minerals of an igneous origin; if it were a fossil, there would be no reason why it should be always found with alteration products of olivine. If a single specimen of typical Eozoon should be found preserved in limestone alone without any serpentinous minerals, then its organic nature could not be doubted. Sir J. W. Dawson claimed to have discovered such, but the "Tudor specimen," on which this claim was based, has recently been redescribed and shown to be neither Eozoon nor in any way organic. At one time Eozoon was very widely accepted, but an overwhelming majority of recent writers have now decided against its organic origin. The recent work of the Canadian Geological Survey, and notably that of Dr. Lawson in the area of Rainy Lake, has shown that the whole of our views upon the Laurentian rocks must be reconsidered.

Epacts (literally *epaktai hemerai*, added days), in ecclesiastical reckoning of time, denote the excess of the solar month over the lunar month, or of the solar year over the lunar year. There are two systems by which the epacts are calculated. The later is the Gregorian Calendar of Epacts, which fixes them independently of sun or moon. The older or Italian system took the solar year as consisting of 365 days and the lunar of 354, the difference being 11 days. Every third year an intercalary lunar month of 30 days was put in, which reduced the difference to 3 days, which the addition of 11 days increased to 14. This process was continued for a cycle of 19 years, when 1 was added to the 20th epact, and the cycle was recommenced. Other adjustments are necessary for leap years. The number of any particular year in the cycle is called the Golden Number; and, if 1 be added to the date of the year and the whole be divided by

19, the resulting quotient gives the number of cycles that have elapsed since the beginning of the Christian era, and the remainder will be the golden number of the year, except when the year is the last of the cycle, in which case there is no remainder.

Epaminondas (418–362 B.C.), a Theban hero, born of a noble but poor family. He soon made his mark as a public man, and in 371 he went to Sparta, to represent Thebes upon the question of negotiating a peace with Athens. The Thebans were excluded from the treaty, but he defeated Cleombrotus during the same year at Leuctra. In 369 he was appointed with Pelopidas joint dictator of his country, and the two invaded the Peloponnesus, freed the Messenians, and marched to Sparta, but owing to the generalship of Agesilaus they could do nothing but lay waste the surrounding country and retire. They were both impeached for holding office beyond the prescribed period, but were acquitted. In 368 Epaminondas again invaded the Peloponnesus, and was partially successful, but failed in an attack upon Corinth. He then went to Thessaly to rescue Pelopidas, who had been captured, and in 362, while at the head of a coalition against Athens and Sparta, he was killed while gaining the victory of Mantinea.

Epaulette, a shoulder ornament, consisting of a "scale" and pendant fringe, worn by commissioned officers of the royal navy above the rank of sub-lieutenant, and formerly worn also by officers of the army. The regulations of 1812 gave a pair of epaulettes to officers of higher rank than lieutenant, and to lieutenants a single epaulette, to be worn on the right shoulder; but epaulettes, when worn, are now always worn in pairs. The rank of the wearer is shown by the devices on the top of the epaulette. These are, for Admiral of the Fleet, three small stars, crossed batons, and crown; Admiral, three small stars, crossed sword and baton, and crown; Vice-Admiral, two small stars, and crossed baton and sword; Rear-Admiral, one large star, and crossed baton and sword; Commodore of the First Class, anchor, chain-cable, two small stars, and crown; Captain, if of three years' standing, as Commodore, if of less, only one small star, with anchor, cable, and crown; Commander, anchor, cable, and crown; Lieutenant of eight years' seniority, anchor, cable, and star; Lieutenant of under eight years' seniority, anchor and cable. The epaulettes are of gold. The distinctive device for navigating officers is crossed anchors.

Epée, CHARLES MICHEL, ABBE DE (1712–1789), a French philanthropist, born at Versailles. He was first educated for the Church, and then, owing to a difficulty about Jansenism, studied law for a time, returning afterwards to the Church. He invented a system of instruction of the deaf and dumb, and after some successful experiments upon two sisters he inaugurated in 1765 a school for carrying out his method. He gave his means and his best personal efforts to this service, and endeavoured in vain to get the matter admitted as a department of public expenditure. He left writings upon the deaf and dumb, and upon his own method of instruction.

Epeira. [SPIDER.]

Epernay, a French town, in the department of Marne, and on the river Marne, 20 miles N.E. of Châlons. It is the centre of the champagne district, and it is estimated that about 5,000,000 bottles yearly are stored in its cellars, 80,000 of which come from the Epernay district. The wine cellars are galleries quarried in the tufa of which the soil is formed. There are manufactures of corks, barrels, and other necessaries of the wine trade.

Ephemeridæ. [MAY-FLIES.]

Ephesians, anciently used to designate the inhabitants of Ephesus, as in St. Paul's Epistle to the Ephesians. It was also used in more modern times to denote boon companions or "jolly fellows," and is used in this sense in Shakespeare's *Henry IV.*

Ephesus, an ancient city of Lydia in Asia Minor, on the south side and near the mouth of the Caystrus. It was one of the twelve Ionian cities, and, having a good and extensive harbour, was a renowned market of the ancient world. It passed successively into the power of Lydia and of Persia. The temple of Artemis was one of the seven wonders of the world, being of Ionic architecture, 425 feet long, with a breadth of 220 feet, and having 127 pillars, 60 feet in height. This temple was several times destroyed, once in 356 burnt by a vanity-stricken maniac or joker, Herostratus, who hoped thereby to perpetuate his name. St. Paul founded a church here, and we read in the Acts of the Apostles of the riot made by those "who wrought silver shrines for Diana," and how the whole mob cried for three hours, "Great is Diana of the Ephesians!" The site is now occupied by a village of peasants, Ayasuluk, and is near a station on the Ottoman railway. Important excavations by Mr. J. T. Wood have revealed much.

Ephod, a vestment used by Jewish priests, and corresponding somewhat in shape, if not in origin (as some think) with the modern chasuble. The ephod of the High Priest was elaborately ornamented, and bore a breastplate of precious stones, upon which the names of the twelve tribes were engraved. Other priests wore a plain linen ephod.

Ephori (literally, overseers) were magistrates in many Dorian communities, of whom the best known are the Ephori of Sparta. Their origin is not known, but their number at Sparta was five, and their functions were to keep a watch upon the conduct of other magistrates, including the king. They also looked after public morals like the Roman censors. They were elected by the people, and entered upon office in the autumn.

Ephraem Syrus (325–378), a Syrian theologian, born at Nisibis. He preferred an anchorite's life, and, shunning preferment, retired to Edessa, where he eventually entered upon deacon's orders. He wrote much in his native Syriac upon theology and upon morals, and also against heretics. His works have been translated into Greek and Latin,

and published in the 16th century at Rome, Cologne, and Antwerp. Some hymns and homilies have been ascribed to him.

Epiblast is the exterior of the two layers of cells, of which the embryo known as the gastrula (q.v.) is composed. From the epiblast the whole of the epidermal structures and the central nervous system are developed.

Epibole. The cells which form the primitive embryonic stage, known as the blastosphere (q.v.), are usually different in size at the two ends. The smaller cells form the external layer or epiblast by two different methods. Either they grow round the larger "endoderm" cells—a process known as "epibole"—or the endoderm cells sink towards the centre of the embryo, a process known as "embole."

Epicalyx, a circle of foliar organs below the flower. Sometimes, as in the strawberry, it is close beneath the calyx, its leaves alternating with the sepals, and probably representing stipular appendages to them. In other cases, as in the mallow, some little length of flower-stalk intervenes, and the epicalyx is then probably merely an involucre of small bracts.

Epicarp, the outer layer in true fruits such as the drupe. It may be smooth and polished, so as to shoot moisture, as in the cherry; glaucous, with a waxy bloom, as in the plum; woolly, as in the peach; or leathery, as in the orange; separable, as in these cases; or less so, as in the lemon. The term is often loosely extended to the outer layer of such receptacular structures, or "inferior" fruits, as the apple or cucumber.

Epicharmus (540–450 B.C.), born at Cos, was a Greek philosopher, a follower of the Pythagorean school, who, after practising philosophy at Megara, came to Syracuse, where he became a dramatist, and is said to have written 52 comedies, which are lost, though 40 of their titles are known. His comedies grew either out of the popular farces of Megara [COMEDY] or, perhaps, out of the mimes, to the detached scenes of which he added a mythological plot, and so gave rise to Sicilian, as distinguished from Ionic and Attic, comedy. Fragments of poems, maxims, and discourses remain, and he was admired by both Plato and Cicero.

Epic Poetry is poetry of a narrative kind, and generally dealing with elevated and heroic stories. Examples are the *Iliad* and *Odyssey* of Homer, Milton's *Paradise Lost*, Dante's *Divina Commedia*, Ariosto's *Orlando Furioso*, Tasso's *Gerusalemme Liberata*, Spenser's *Faëry Queen*, the German *Nibelungenlied*. Pope's *Rape of the Lock* is an example of the mock-heroic epic, and the German *Reynard the Fox* and Homer's *Battle of the Frogs* are examples of the animal epic. The word is also used as an adjective to denote "fit for epic poetry," as when Tennyson speaks of a Princess "grand, epic, homicidal."

Epictetus (b. 60 A.D.), a Stoic philosopher, born in Phrygia, was a slave in Rome of Epaphroditus, one of Nero's body-guard, who treated him with cruelty. Afterwards freed, he gave discourses on philosophy, and taught that man is of himself weak, that he should strive after a standard of good and evil, and that philosophy is the messenger of God to lead men back to better things. Although it is not known as a fact, it is not impossible that he may have come in contact with Christian teaching. He was banished by Domitian, and settled in Epirus. Arrian, his pupil, collected his sayings (*Enchiridion*), and there are four books of philosophical maxims. Both these works have been edited, and there is an English translation by Long.

Epicurus (342–270 B.C.), a noted Greek philosopher, was a native of Samos, where he lived till 18. He then came to Athens, where he is said to have attended the lectures of Xenocrates, then head of the Academy, and then went to Colophon, where his father taught and where he gave lessons in grammar. He then taught philosophy at Mitylene and Lampsacus, and he came in 306 to Athens, where he bought a garden and lectured to many pupils. He was simple of nature and abstemious in habits, took no part in public affairs, and bore the infirmities that came upon his later life with great fortitude. He was a general favourite. In his ethical system he taught that pleasure and pain were the chief good and evil respectively to be sought and avoided, and that virtue should be sought as a means to peace of mind, which is the highest happiness. He has been misrepresented to such an extent as to have become proverbial as the embodiment of sensual greed as the "pig satisfied," and Milton speaks of the "Epicurean sty." But however some of his followers may have misinterpreted him, his system is hardly more Epicurean (in the modern sense of the word) than the system which makes the greatest happiness of the greatest number the standard of action is selfish. In his physical system Epicurus was a follower of Democritus and Diagoras, and held the atomic theory, and that sensation is the result of reflection or emanations (*eidola*) given off by matter. His doctrines were mainly popularised by Lucretius.

Epicycle, in the older systems of astronomy, was an arrangement for representing the motions of the heavenly bodies. The sun, moon, and planets were first conceived to revolve round the earth in circles (the perfect figure); when this assumption failed to explain the phenomena it was assumed that they moved in circles the centre of which revolved round the earth (epicycles, or "circles upon circles"). Further epicycles on these second circles were added with the progress of observation, till the whole complicated scheme was swept away by Kepler (q.v.).

Epicycloid, in *Geometry*, is the curve traced out by a point on the circumference of a circle that rolls round another. If the fixed circle becomes greater and greater, so as to approximate to a straight line, the epicycloid approximates to the *cycloid* (q.v.). If the rolling circle move on the concave side of the fixed curve it generates the *hypocycloid*. If the two are of equal magnitude, the point on the rolling circle just describes one

closed curve in one revolution; this curve is the *cardioid*. Of hypocycloids may be mentioned the *four-cusp*, formed when the rolling circle is one-quarter the diameter of the fixed circle. This curve is the envelope of a line of fixed length moving so that its extremities are kept in two lines at right angles to each other. If the inner circle is one-half the diameter of the outer, the special hypocycloid obtained is the straight line. Such curves were once important in astronomy. [EPICYCLE.]

Epidaurus, a town and seaport of ancient Argolis in the Peloponnesus, celebrated for its temple of Æsculapius, which was on a height near the town, and according to an inscription upon it was "open only to pure souls." Yearly numbers of sick people made pilgrimages to it in search of miraculous cures.

Epidemic (from two Greek words *epi*, upon, and *demos*, a people), a term applied to a disease which attacks whole communities and is capable of spreading so as to involve, it may be, the inhabitants of countries widely separated from one another; for example, the Asiatic plague, the Black Death of the 14th century, cholera, and epidemic influenza are all instances of epidemic diseases. It was at one time the fashion to ascribe epidemics to atmospheric influence, and it was customary to use the term "epidemic constitution" to indicate the peculiar conditions of climate and of the atmosphere, which were supposed to determine the invasion of communities by particular epidemic diseases. The doctrine of the germ theory of disease has considerably modified these older views. The reason why the spread of certain diseases is so much greater at some times than at others remains, however, in great part unexplained.

Epidermis (Gk. *derma*, skin), the outer covering of the skin. The skin consists of two parts, the corium or true skin, which is raised externally forming a number of prominences called papillæ, and the epidermis or cuticle, which is superimposed upon the corium, and is accurately moulded over the papillæ, between the depressions of which it dips. The epidermis is composed of layers of epithelial cells. [EPITHELIUM.] These cells are usually described as being arranged in four layers; commencing from within, the first layer, that lying next the corium, is the *stratum Malpighii*, which is composed of spindle-shaped or rounded cells; it is this layer which fills up the depressions between the papillæ; proceeding outwards the next layer is known as the *stratum granulosum*, and consists of a single layer of flattened cells, containing a number of granules. External to this is the *stratum lucidum*, so called from its cells presenting a clear, bright appearance, while most external of all is the *stratum corneum*, which consists of a large number of layers of much-flattened cells. The nucleus, which is a prominent feature in the cells of the deeper layers, becomes gradually lost on proceeding towards the surface, and is completely absent in the most superficial cells of the *stratum corneum*: these last, in fact, consist of mere degenerate scales, and can scarcely be termed cells at all. The outer layers of the *stratum corneum* are continually being rubbed off, and are replaced by the cells from below; these as they approach the surface become more and more flattened and degenerate. The thickness of the epidermis varies much in different parts of the body; it is thickest in the palms of the hands and soles of the feet. In negroes pigment granules are dispersed throughout the *stratum Malpighii*, and these give rise to the coloured skin of the dark races of mankind. In *Botany* the term is applied to the outer system of cells in most plants serving as a protection and checking excessively rapid transpiration. In some algæ and mosses a rudimentary or indistinctly differentiated epidermis occurs; but in higher plants this layer is formed from a primitive merismatic dermatogen. Some of the cells of the epidermis, both on roots and on aërial structures, are often elongated into hairs, which may become divided into several cells, and the walls of which are commonly unthickened. The outer cell-walls of the rest of the epidermis of aërial organs generally form the continuous structureless membrane known as cuticle (q.v.); but the epidermis of the root, requiring to admit moisture rather than to retain it, is generally not cuticularised. The cells of the epidermis commonly contain air or water, with little or no chlorophyll, and can be peeled off as a colourless membrane. In some evergreen leaves there are two or three layers of epidermis. On the stems of perennial plants the epidermis is generally split and thrown off at the end of the first season by the development of cork (q.v.) beneath it, so that smooth green shoots become brown and finely furrowed; but mistletoe (q.v.) retains its epidermis by its remaining merismatic, and in roses and willows the epidermis itself becomes the phellogen or cork-cambium, and gives rise to cork externally. Most surfaces of epidermis in contact with the air are interrupted by openings for transpiration known as stomates (q.v.), which are surrounded by two or more guard-cells that retain both protoplasm and chlorophyll. Submerged structures and roots have no stomates, for which reason the epidermis of the latter was at one time distinguished as "epithelium."

Epigenesis, the biological truth that the development of organisms is the progressive differentiation of a primarily homogeneous germ. This truth, propounded by Aristotle in his work on the generation of animals, was defended by Harvey in his *Exercitationes*, published in 1651, on the evidence of his observations on the incubation of the hen's egg. He says in effect that the formation of the new organism is not the sudden and simultaneous accretion of rudiments of all the organs of the adult, nor the sudden metamorphosis of formative substance into a miniature of the whole organism, but an epigenesis or successive development of the parts from the originally homogeneous rudiment. This view, disputed by Malpighi, Leibnitz, Bonnet, and Haller, was finally established by Caspar Frederick Wolff in his *Theoria Generationis* (1759).

Epiglottis (from two Greek words signifying, upon the tongue), the structure which lies upon

the root of the tongue, and which in the act of swallowing becomes superimposed upon the aperture of the larynx in such a way as to prevent the entrance of the bolus of food into the air tubes, and to direct it downwards into the gullet. The epiglottis consists of a framework of elastic cartilage, covered on its upper and lower surfaces with epithelium. [LARYNX.]

Epigram once denoted, as its etymology *epi* (upon) and *gramma* (writing) shows, an inscription, and then it came to mean a poetical inscription upon a temple, and then came to denote a short poem, sometimes satirical, but always of a witty nature, and often ending in a surprise. Such are the epigrams of Martial and Catullus. It has been said that an epigram should be like a bee:—

> "The body should always be little and sweet,
> And a sting should be left in its tail."

A well-known example of epigram, adapted from Martial, is that running:—

> "I do not like thee, Dr. Fell,
> The reason why I cannot tell;
> But this alone I know full well,
> I do not like thee, Dr. Fell."

Epigynous, "upon the ovary," a term applied to the petals and stamens when they are so carried up by receptacular growth adherent to the ovary as to appear to spring from the top of it. The ovary in these cases is inferior; the calyx, superior. Epigynous insertion occurs in the *Umbelliferæ* (q.v.) and some other Calycifloræ (q.v.), and gives the name Epigynæ to series of Gamopetalæ (q.v.), Incompletæ (q.v.), and Petaloid Monocotyledons (q.v.).

Epilepsy is a disease of the nervous system, in which occur, at irregular intervals, attacks of mental disturbance, which are usually characterised by loss of consciousness followed by tonic and clonic convulsions. The epileptic seizure presents widely varying characters in different patients; it must suffice to describe the phenomena of what may be considered a typical fit. The attack is usually immediately preceded by some warning, whether it be a sense of oppression in the region of the stomach, some peculiar sensation in one or other part of the body, or some imagined impression affecting the organs of special sense. This warning, the *epileptic aura*, as it is sometimes called, is immediately succeeded by the actual fit. The patient often cries out, falls down with much violence, and loses consciousness, the muscles become affected by tonic spasm, and respiration ceases. These phenomena last a few seconds only, and are succeeded by a stage of clonic convulsion. The muscular contractions of this stage may affect one side of the body only, and tongue-biting often occurs. The countenance of the patient is usually livid from obstruction to the natural muscular movements of respiration. After from one to two minutes this stage ceases, the convulsive movements no longer continue, and the lividity passes away, but the loss of consciousness still continues for awhile; the patient usually "comes to himself" quite gradually, and it may be some hours before recovery is complete. A fit such as has been described is a severe one (*haut-mal*); all degrees between this and the mildest forms (*petit-mal*) are met with. In the very slight cases the attack may be so ill-marked as to quite obscure the real nature of the disease; for example, it may be a mere temporary seizure of giddiness, in which perhaps the patient does not fall down and in which no convulsion occurs. Such attacks are sometimes followed by grave mental disturbance, during the existence of which the patient may perform all kinds of unaccountable actions. In instances of this kind the true nature of the malady is sometimes quite overlooked, the attacks of giddiness being described as fainting fits, while the consecutive mental disturbance is sometimes the cause of much trouble and misapprehension. In some cases one fit has barely passed away before another occurs, and when the number of seizures is considerable the condition is said to be one of *status epilepticus*. The causation of the disease is obscure. It is oftentimes hereditary, and is also associated with the family history of other forms of nervous affection (insanity, hysteria, chorea). The first attack usually occurs between the ages of ten and twenty, and very rarely after forty years of age. The interval between the attacks is of very varying duration; it may be only a few hours, more often a few weeks; in some instances one seizure may succeed another only after an interval of years. Between the attacks the patient may be "quite himself"; in the more established disease, and particularly where fits occur at short intervals, there is usually permanent mental disorganisation, which may amount to actual insanity. The diagnosis of epilepsy is often a matter of some difficulty. It is particularly hard to distinguish in some instances between epileptic and hysterical attacks, and, moreover, the two are often found in association with one another. True epilepsy, however, is independent of the surroundings of the patient, and of the fact of the presence of sympathising onlookers. It occurs quite as frequently, often more frequently, by night than by day. The severer fits are often accompanied by considerable bruising and by tongue-biting (both rare occurrences in hysteria); and the history of the case, and an inquiry into the family history, often throws light on the matter.

Treatment. During a fit the patient should be carefully watched to prevent any injury occurring during the initial stage, and his clothes should be loosened so that there may be no hindrance to respiration. Various drugs are administered to the subjects of epilepsy. Bromide of potassium may be particularly alluded to; in some cases its use is attended with considerable benefit.

Epilobium, a genus of *Onagraceæ*, comprising some 50 species of perennial herbs and undershrubs native to the colder regions of both hemispheres. Their narrow tapering leaves have gained them the name willow-herb. The flower is generally pink or red, but less commonly white or yellow. It has four petals, eight stamens, and an elongated four-chambered inferior ovary, containing

numerous seeds, each having a tuft of long hairs. Of some twelve British species several are inconspicuous, but *E. hirsutum* is known as "Codlins-and-cream," from the peculiar scent of its leaves and shoots, and the long, erect racemes of *E. angustifolium*, the Rose Bay, are still more conspicuous, so that it is commonly cultivated.

Epilogue (Gk. *epi*, upon, *logos*, discourse), an address given to the audience at the end of a play. Many of Shakespeare's plays have epilogues, as have also many of the comedies produced in the last century.

Epimenides, a half mythical poet or philosopher of ancient Greece, who was born in Crete and lived at Gnossus. He was looked on as a prophet and almost divine, and was once summoned to Athens as the fittest man to reconsecrate a temple that had been polluted. For this service he refused all reward, but begged for the friendship of Athens on behalf of Gnossus. A legend represented him as having slept in a cavern for fifty-seven years, and found all around him altered when he awoke—a legend which is familiar to most of us in its modern form of *Rip Van Winkle* as told by Washington Irving, and to some as the subject of Goethe's poem, *The Waking of Epimenides.*

Epinal, a town of France, in a valley of the Moselle, and capital of the department of Vosges, 190 miles S.E. of Paris. It is partly on the right bank of the river, and partly upon an island in it, and has a suburb on the left bank. It is well-built, and has good quays, a Gothic church, a college, a museum, a public library of 20,000 volumes, and a ruined castle on a height. There are manufactures of iron and brass goods and cutlery, earthenware, leather, oil, and chemicals.

Epiornis. [ÆPYORNIS.]

Epipetalous (upon the petals), a term applied to the stamens in many gamopetalous flowers, such as primrose and lilac, when an intercalated receptacular outgrowth forms a common tube below both the true corolla-tube and limb and the anthers, so that the latter appear to spring in a more or less sessile manner from the corolla-tube. The same structure is termed *Epiphyllous* among petaloid monocotyledons, such as *Narcissus*, and other cases where the perianth is not readily distinguishable into calyx and corolla, as in *Daphne.*

Epiphanius, ST. (310–402), Bishop of Constantia, born of a Jewish family in Palestine. Having a taste for solitary life, he retired to a monastery which he founded near his native town. In 367 he became Bishop of Constantia in Cyprus. He was a good theologian and linguist, and a great hater of heretics, especially Arius and Origen. He travelled much. His *Panarion* gives the history of many heresies and their refutation, and he wrote a treatise upon Jewish weights and measures. His feast-day is the 12th of May.

Epiphany (Greek *epiphainein*, to shew forth), the name given to the celebration upon the 6th of January of the making known of Christ to the Gentiles. This festival is also known as Twelfth Day, and the Feast of the Three Kings. In a wider sense, the word is used to denote any divine appearance.

Epiphytes, plants which grow attached to others without being in any way parasitic upon, or deriving any nourishment from them. They are most numerous in the moisture-laden climate of equatorial forests, having commonly aërial roots, by which they absorb atmospheric moisture. Many ferns, such as the elk's-horn (*Platycerium*), orchids and Tillandsias live in this way. The ivy (q.v.) and some Tropæolums approximate to the habit, living for some time after connection with the ground has been severed.

Epiphytic Orchids, a large proportion of the tropical members of the order which live as epiphytes (q.v.). Their aërial roots are often green, and are sometimes furnished with a special spongy external absorbent layer, or *velamen.* Their branches are commonly thickened into ovoid green "pseudo-bulbs."

Epipodia, the wing-like expansions of the foot of some Mollusca; they are typically developed in the Pteropods (q.v.).

Epirus anciently comprised north-western Greece, but now signifies the southern part of Albania, and is the province bordering upon Greece. There are mountains running in a north and south direction, traversed by valleys, and the district generally is wild, mountainous, and infested with brigands. In the plain of Janina the oracle of Dodona is thought to have been situated, but the oaks and fountain are not to be traced. It is probable that the gloomy mystery of the region gave the idea of Acheron, Cocytus, and Avernus. The people were probably of Pelasgic origin afterwards mingled with Greek settlers. Of the 14 tribes with separate kings, the Molossi became supreme, and their king became king of Epirus. Pyrrhus was perhaps the most notable of these kings. When freed from the Macedonian yoke the country gave Rome much trouble, and Paulus Æmilius treated it severely, destroying 70 towns, and sending 150,000 people into slavery. It was at a later period subdued by the Turks, but in the 13th century it became again autonomous for two centuries under what were called the Despots of Albania. The last of these was George (Scanderbeg), at whose death in 1467 the land again fell into the power of the Turks.

Episcopius, SIMON (Hollandish-Biscop, 1583–1643), a Netherlandish theologian, born at Amsterdam. He graduated at Leyden in 1606, and studied under Arminius and his opponent Gomar, finally taking the side of Arminius. In 1610 he became pastor of a village near Rotterdam, and pleaded the cause of the Arminians in a conference at the Hague. His appointment as Professor of Theology at Leyden gave great offence to the Calvinists, and he and his adherents were condemned at the Synod of Dort. For a time Episcopius retired to Rouen, where he wrote on behalf of Arminianism, and also had a controversy with a Jesuit. In 1626 he returned to Holland, and died Rector of the Arminian College at Amsterdam. Among his works are his

Confessio (1622), *Apologia pro Confessione* (1629), and *Institutiones Theologicæ*, written after his return to Holland, and left unfinished at his death.

Epistaxis (from the Greek, to drop or let fall), bleeding from the nose. Epistaxis may occur as the result of injury, and is caused in rare instances by growths affecting the back of the nose or pharynx. It not uncommonly occurs spontaneously, particularly in young adults and in persons of middle age. The treatment of epistaxis consists in enforcing absolute rest and applying cold. Elevation of the arms is a useful expedient in mild cases. In some instances, when the flow is excessive, much more extreme measures must be adopted, such as plugging the *nares*. For the performance of this operation, however, skilled assistance would have to be obtained.

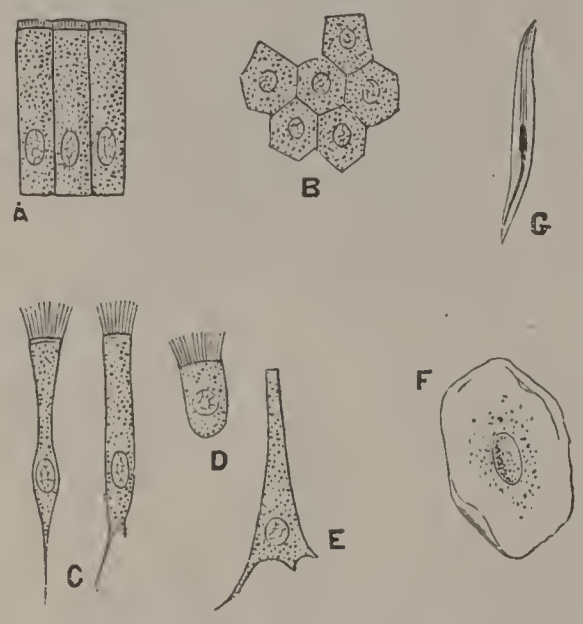
Epistolæ Obscurorum Virorum ("Letters of insignificant men"), a title given to some burlesque and witty, though often indecent letters published at Cologne in the 16th century, and having for their object the bringing into contempt the literary doctrines and methods of the schoolmen and monks. These letters emanated from the knot of scholars of the revival of learning, and have been variously attributed to Reuchlin, to Erasmus, and to Ulrich von Hutten. The last of the three did write a second part in 1517, but the first part appeared in 1516, and is said to have been the work of Crotus Rubianus. The letters had some influence in bringing about the Reformation, and were placed upon the *Index*. There is an edition with commentary (1889).

Epitaph (*epi*, upon, *taphos*, tomb), originally meant either an address delivered at a tomb, or an inscription upon it, which latter meaning is the only one borne by the word at the present day. The Egyptian epitaph consisted of the name and condition of the dead with perhaps a prayer, but the Greek epitaph was of a poetical and elaborate character. The Roman epitaph was simple, and, as tombs were often by the wayside, "*Siste viator*" was a common one. The 18th century in England was an age of tedious and exaggerated epitaphs, of which there are examples in Westminster Abbey and in many churches and cathedrals. A noble epitaph is the well-known one to Sir Christopher Wren in St. Paul's: "*Si monumentum quæris circumspice.*" Shakespeare's epitaph is also well known. There are endless examples of quaint, comic, and eccentric epitaphs to be found in our country churchyards. Some are elaborate allusions to the calling or trade of the dead they commemorate, as, for instance, those of Benjamin Franklin, of a blacksmith in Sutton churchyard, Surrey, and of the pie-woman. Some witty epitaphs have been written—*e.g.* Piron's, composed by himself—

> "Ci-git Piron, qui ne fut rien,
> Pas même Académicien."

Epithalamium (Gk. *thalamos*, chamber), an ode composed and sung outside a bridal chamber upon a wedding-night by young men and maidens, the companions of the newly-wedded pair. Sappho, Pindar, Theocritus, Catullus, and Spenser have all made notable compositions in this kind of poetry. Shakespeare often makes use of the word, and Burnet speaks of one of the Psalms as an epithalamium to Christ and His Church.

Epithelium. The skin and the various mucous membranes of the body are covered with an investment of cells known as *epithelial cells*. These cells are of various shapes. They may be *columnar*, a single layer of such cells lining the mucous membrane of the alimentary canal from the cardiac end

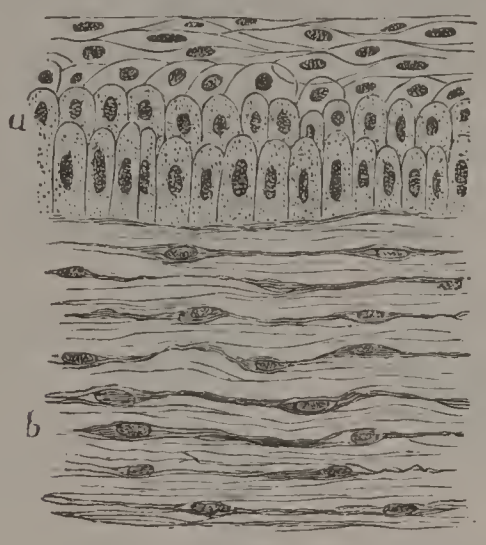


VARIOUS KINDS OF EPITHELIAL CELLS.

A, Columnar cells of intestine; B, Polyhedral cells of liver; C, Ciliated cells of trachea; D, Ciliated cells of frog's mouth; E, Inverted conical cell of trachea; F, Squamous cell of mouth; G, Squamous cell seen edgeways.

of the stomach downwards, and also occurring in the tubules of the kidney, the small bronchi, and in many glands. They may be squamous or flattened, as in the superficial layers of the epithelium of the skin [EPIDERMIS]; or they may be conical, fusiform, or polyhedral. A simple epithelium is one in which only a single layer of cells is present. In the stratified forms there are several layers one superimposed upon the other. Thus excellent examples of stratified squamous epithelia (pavement epithelia) are met with in the epidermis, in the tongue, cavity of the mouth, pharynx, œsophagus, and on the surface of the cornea, while stratified columnar epithelium is met with in the mucous membrane of the larynx, trachea, and large bronchi. The situations in which simple columnar epithelium occurs have already been detailed. A single layer of flattened cells, simple squamous epithelium (*endothelium*, as it is often called), is met with on the surface of serous membranes, and in the lining walls of blood-vessels. An epithelial cell consists of a nucleated mass of protoplasm, and the individual cells are in close apposition one with another, being merely separated by an insignificant amount of intercellular substance (interstitial cement substance). Ciliated cells present on their free surface a fringe of very fine hair-like processes termed cilia; these processes in the living cell are in rapid movement, as can be well seen, for example, in a scraping from the roof of the mouth of a frog (D in figure); the movement

produces an appearance such as is seen when the wind sweeps over a field of corn. In the human subject ciliated cells occur in the trachea and in other parts, but are not nearly so widely distributed



STRATIFIED EPITHELIUM OF THE CORNEA.

as in some of the lower animals. Two other varieties of epithelial cells may be mentioned: *goblet* or *chalice cells*, which are met with in mucous glands, and in the mucous membrane of the respiratory and alimentary tracts; and the *prickle* cells which are found in the deeper layers of the *stratified pavement* epithelium of the skin. Some epithelial cells are filled with black pigment granules (choroid and iris, and in the skin of negroes).

Epizoa, a subdivision of the Crustacea once accepted for the three sessile and degraded orders, the Cirripedia, Ichthyophthira, and Rhizocephala. The group is, however, now abandoned, and included in the sub-class Entomostraca (q.v.), as the Rhizocephala are regarded as degraded Cirripedia and the Ichthyophthira as parasitic Copepods.

Epoch of a planet at any instant is its mean longitude reckoned from the sun. It is one of the elements in a planet's orbit. In *kinematics*, the epoch of a simple harmonic motion (q.v.) denotes the position of the moving body, measured either from its extreme or mid-point, from which time is reckoned.

Epping, a village of Essex, 17 miles from London, on the border of Epping Forest.

Epping Forest, some 5,500 acres of forest-land in the south-east of Essex, is the remnant of the royal Forest of Essex, which before the reign of John extended over almost all the county, and which was then limited to the Forest of Waltham, some 60,000 acres. Before the Reformation, subject to the sporting rights of the Crown, this was mainly vested in the abbeys of Waltham and Barking; but there was also a right to pasturage, pannage of pigs, and lopping of trees for fuel, belonging to the commoners. Hainault Forest, east of the river Roding, having been grubbed up in 1851, and extensive encroachments having taken place, the remainder was between 1865 and 1870 in danger of destruction, the lords of the manors having compounded separately with their commoners. The Corporation of London, happening to hold rights of common in virtue of a cemetery at Wanstead, successfully maintained the right of "intercommonage" over the whole forest. In 1878 an Act was passed by which it was "disafforested"—(*i.e.* ceased to be royal)—the Corporation becoming conservators, purchasing the manorial and lopping rights, and maintaining the forest "as an open space for recreation and enjoyment." The forest consists of extensive woods of pollard hornbeam, several groves of fine beeches, with a good deal of holly undergrowth and occasional large crab-apple trees, wide patches of heather and birch, and bordering grass-lands. Oaks are not very numerous. The Act provides that "the natural aspect of the forest" is to be maintained, and it has long been the favourite hunting-ground of the London entomologists and fungus-hunters, besides affording a playground for countless school treats, volunteer corps, cricket clubs, and devotees of golf. Birds of many kinds are increasing in the forest; the ancient dark breed of fallow-deer have multiplied considerably; and the roe-deer and the badger have been successfully reestablished. In the heart of the forest are two pre-Roman camps. At Chingford is a fine Tudor half-timbered building known as Queen Elizabeth's Lodge. In 1882 Queen Victoria declared the forest to be open for ever as a recreation ground.

Epsom, a town of Surrey, 15 miles S.W. of London, once renowned for its mineral springs (whose salts gave their name to a valuable mineral salt now obtained elsewhere), and still renowned for its races, the chief of which are the "Derby" and the "Oaks," in early summer, and which for a long time past have been the carnival of London, and have provided material for the painter, the novelist, and the student of national character. [DERBY DAY.]

Epsom Salts consist of hydrated sulphate of magnesium $MgSO_4 + 7OH_2$. It is found naturally in sea water and in many saline springs, and as the mineral epsomite. A sulphate *kieserite* containing less water ($MgSO_4 + OH_2$) occurs largely in the salt beds at Stassfurt. Epsom salts are prepared from all these sources. It is obtained from sea water by further evaporation of the *bittern* (q.v.). It is also obtained from the crude Stassfurt kieserite, and by treating *dolomite* or magnesian limestone with sulphuric acid. It crystallises in rhombic prisms, very soluble in water and possessing a bitter taste. If heated, six of the water molecules are driven off at 153°, but the remaining molecule is not evolved until a higher temperature, 200°, is reached. It is largely employed in the chemical laboratory, and is the chief source of other magnesium compounds. It is much used in dyeing, and employed in medicine as a purgative.

Equations. 1. In pure and applied mathematics, are expressions representing the equality of two or more entities. For convenience these entities are expressed symbolically by letters or other such signs. Very little has been done with any but algebraic equations—*i.e.* those dealing with number. In quaternions the equality of entities involves more than equality of their magnitude, for direction and sense of the vectors (q.v.) are included in the

symbols adopted. Also in symbolic logic, the equality of many properties or attributes of the symbolised entities may be involved by the equation. These latter are examples in what are called non-commutative algebras, which are not yet studied by mathematicians so fully as their importance deserves.

Ordinary algebraic equations are meant to exhibit identities. Some of the identities may be proved by ordinary processes to be true whatever be the values of the symbols employed. Thus

$$(a + b)^2 = a^2 + 2ab + b^2$$

tells of the identity of the two expressions separated by the sign of equality $=$. The equation is true whatever be the values of a and b; it is called an *identical equation*, or *identity*. On the other hand, an equation may not be true unless certain symbols represent certain determinate numbers. Thus $a^2 = 3a$ is only true when $a = 3$ or $a = 0$. Such equations are *conditional*, and it is one of the most important processes in algebra to discover the conditional values upon which the identity of the equation depends. These values are called the *solutions* or *roots*.

A single equation containing one unknown quantity is sufficient to determine that unknown. If this only occurs in the *first degree—i.e.* multiplied by some known number and not by itself—we have a *simple* equation, which admits of but one answer. That is to say, only one value of the unknown will make the equation true. If of the second degree, the unknown occurring as a square, the equation is *quadratic*, and there are two solutions, as in the example of $a^2 = 3a$ above quoted. An equation of the third degree is a *cubic*, and has three solutions; and so on for higher degrees. There are general methods for the solution of equations of the first four degrees; various special cases of quintics (of the fifth degree) may be solved, but it is shown that no general solution can be given for them.

If an equation contains two unknowns, x and y, it is insufficient to give both their values, and a second equation connecting them is necessary. Such a pair of equations are termed *simultaneous*. Three are necessary to determine three unknowns, four for four unknowns, and so on.

Equations in astronomy generally mean corrections to observations. Thus in the article DAY it is stated that the solar days throughout the year are not actually of constant length, and that for convenience an average length was chosen, and called a mean solar day. A clock records mean time, but a sundial records *apparent* or solar time. The term *equation of time* is used to denote that which must be added to or subtracted from the apparent time at any instant to give the mean time. The two only coincide four times during the year.

Equation to the centre of a planet means a correction necessary to apply to the motion of a planet when assumed to travel in a circle round the sun as centre.

Personal equation means a correction to be applied to an observation on account of defect in the observer. Thus a measurable though small interval of time exists between an event and the observer's most rapid notification of the event. This interval is his personal equation of time; it varies in different persons and somewhat for different senses, being different if the event is a flash of light, a sharp sound, or a sudden contact with the observer.

2. Equations, in *Chemistry*, serve to express the interactions which take place between different compounds, the formulæ of the reacting bodies being placed on the left hand side of the equation, those of the products on the right, *e.g.* $2KOH + H_2SO_4 = K_2SO_4 + 2OH_2$. [CHEMISTRY.] By a slight extension of the equation the heat evolved or absorbed by the reaction may be also indicated. Thus the equation $\mathbf{PbO} + H_2SO_4\,Aq = \mathbf{PbSO_4} + Aq = 142{,}200$ cal. states that when 223 grams of oxide of lead are dissolved in dilute sulphuric acid 303 grams of solid lead sulphate are formed with the evolution of 142,200 units of heat (caloric = quantity of heat required to heat 1 gram of water through 1° C.). In this the notation frequently used now is employed, *i.e.* the use of thick type to indicate solids, ordinary type for liquids, while gases would be indicated by italics. Aq indicates an indefinite but comparatively large quantity of water.

Equator is the great circle on the surface of the earth, equidistant from the poles. It is the greatest circle that can be drawn on the earth, and is 24,899 miles in circumference. The celestial equator is the great circle in the celestial sphere midway between the poles; it represents the intersection of the plane of the terrestrial equator with the celestial sphere.

Equatorial, in *Astronomy*, is a telescope designed and arranged for special observations. The telescope itself is capable of rotating at right angles about one axis, and this again may be rotated about a second at right angles to the first. The first is called the *declination* axis, and the second the *polar;* the latter is fixed in position so as to point to the poles. Rotation of the telescope about the declination axis commands a view along a meridian. If clamped to this axis and rotated about the polar axis, it views points on parallels of declination, all these points being at the same distance from the pole. Such a parallel is the path of a star or planet, and if the polar axis is rotated at the proper rate by clockwork, the telescope may be made to "follow" the object viewed. Equatorials are the most convenient in this latter respect, and also for finding objects from the usual data of declination and right ascension. The largest telescopes are therefore built with the equatorial mount, as, for example, the 23-inch Clark telescope at Princeton, the 4-foot Melbourne reflector, and the great 36-inch Lick reflector in California. [TELESCOPE.]

Equestrian Order, THE (Lat. *equus*, horse), formed in early days the cavalry of the Roman army. These were said to have originated with Romulus, who caused each of the three tribes to furnish 100 horsemen. Later their number was increased to 3,600, who might be appointed from

patricians or plebeians, and still later a property qualification admitted to what had become a privileged political order. The horse for a long time, as well as pay for his keep, was provided by the state, and the censors had power to take away a man's horse—*i.e.* degrade him from the order—for misconduct. By the time of the Gracchi the order had practically ceased to have military importance, and became a capitalist and commercial, but non-noble class. From that period to the reaction under Sulla (except for a short interval) the order exercised the judicial functions till then confined to the Senate, while after 70 B.C. they shared them with the Senate. Under the Empire the order gradually declined in power and importance.

Equidæ, a family of Perissodactyle Ungulates containing the Ass and the Horse (both of which see).

Equilibrium. 1. In *Dynamics*, a condition of balance among the set of forces acting on a body, such that there is no resultant tendency to change its state of rest or motion. The forces acting on a book lying on a table, which include the various pressures of its different particles downwards on the table, and the upward supporting forces of the table, are in equilibrium and the book does not change its state of rest. Also a train pulled along by a locomotive at its maximum rate of motion is acted on by the tractive forces of the engine and by various resistances of the rails, air, etc. These forces are in equilibrium, and the train does not change its state of uniform motion. Thus equilibrium of the forces acting on a body, and the state of rest of the latter, must not be confused with each other. The study of forces in equilibrium is known as *Statics*.

2. In *Chemistry*. When a chemical system arrives at a state in which no further change occurs, a reaction and reverse reaction taking place at equal rates, the system is said to be in chemical equilibrium. Thus if sulphuric acid be added to a solution of sodium nitrate a reaction will take place, represented by

$$H_2SO_4 + 2NaNO_3 = 2HNO_3 + Na_2SO_4,$$

resulting in the formation of nitric acid and sodium sulphate. These products, however, by their interaction can give rise again to sulphuric acid and sodium nitrate. When the proportions of these acids and salts reach a certain value the two reactions proceed at exactly equal rates and there is no further change. In all dissociation (q.v.) phenomena also, for every temperature there is a definite pressure of the dissociated gases at which equilibrium occurs, the products recombining at the same rate as the body dissociates. The subject of chemical equilibrium has within late years been approached with great success from the mathematical standpoint.

Equinox, in *Astronomy*, is the time when the sun apparently crosses the plane of the equator. It is sometimes understood as the *equinoctial point*, or point where this crossing is effected. It occurs twice a year—on the 21st of March and the 22nd of September; the first is called the *vernal* equinox, and the second the *autumnal*. At these times, the sun being directly over the equator, the days and nights are of equal length; at the vernal equinox the days are becoming longer than the nights, and at the autumnal equinox the days are becoming shorter. The vernal equinoctial point is known as the *first point in Aries*, and is important in star measurements. The line joining the two equinoctial points is called the line of the equinoxes, and the fact of the gradual change in position of this line is of much importance in astronomy. The earth's axis remains at a constant angle to the plane of the sun's apparent motion, but does not remain constant in direction. Just as a spinning-top may wobble, with its mass-centre motionless and the extremities of its axis describing circles, so that this axis is for some time at the same angle to the ground, so the earth's axis wobbles at a constant angle to the plane of the ecliptic. This affects the line of the equinoxes, and causes it to slowly travel round; hence the term *precession of the equinoxes* in describing this irregularity of the earth's motion. The lengths of summer and winter depend on the position of the equinoctial points. If we divide the year into two parts, calling that portion summer between vernal and autumnal equinoxes, and the rest of the year winter, we may say that our winter in the northern hemisphere is eight days shorter than summer. But with a different position of the line of equinoxes an extreme winter thirty-three days longer than the corresponding summer may occur, or an extreme summer thirty-three days longer than the corresponding winter. Such extremes are 10,500 years apart, but they represent widely different conditions of climate; the first extreme gives us a glacial epoch and the second a genial epoch. Our present condition is intermediate, in the northern hemisphere tending to a genial epoch but in the southern tending to a glacial epoch. [EARTH, PRECESSION, NUTATION.]

Equisetum, the only existing genus of the order Equisetaceæ and the class Equisetinæ of the Pteridophyta (q.v.), comprising some twenty-five species, found in most parts of the world, except Australasia. They are isosporous, like most ferns; but the spores have three coats, of which the outermost is spirally split into four hygroscopic elaters (q.v.), which uncoil in dry air, and serve to link the spores together when dispersed. On germination they produce dicœcious prothallia, those least nourished being smaller and bearing antheridia. The antherozoid is comparatively large, twice or thrice coiled, and dilated posteriorly. The female prothallus, like a curly endive leaf half an inch long, bears archegonia like those of ferns. The sporophyte consists of a creeping rhizome sending up erect branches that are generally annual. These are articulated and strongly fluted, each ridge ending at the node above in one leaf-sheath of a ring, which lie in the grooves of the next internode. The internodes are hollow, the nodes solid; there is a fibro-vascular bundle in each ridge with a central (carinal) air-cavity, and sometimes other (vallecular) air-passages in the cortical tissue one below each furrow. In the furrows of the stems are

numerous stomata. In some species the "fructification" terminates a short special unbranched branch which, having no chlorophyll, is brown; in others it terminates a green branch which bears whorls of branches at each node. It consists of a cone made up of whorls of sporophylls each of which is a pettate sorus bearing from six to nine sporangia round its margin. All the cell-walls of the plant are strongly impregnated with silica, amounting to more than half the ash of the plant, so that large quantities of *E. hyemale* are imported as "Dutch rushes," and used in bundles for polishing purposes. None of the existing species approach the dimensions of the fossil Equisetinæ of Palæozoic rocks, such as *Calamites*, *Annularia*, and *Asterophyllites*. These all differ apparently from our Equisetaceæ in producing spores of two kinds (megaspores and microspores), being, that is, "heterosporous."

Equitant (meaning astride like the legs of an equestrian) is a term applied to the folding of leaves in the bud when each is folded longitudinally down its midrib, like the two halves of a sheet of note-paper, and the edges of one overlap both edges of another and younger leaf, as if astride of them. The leaves of *Iris* are folded in this way. When, as in the sepals of the poppies, the edges of one leaf are astride of one edge of another it is termed *half-equitant*.

Equity, a species of unwritten law, so termed by way of distinction from the original and proper law of England or (as it is usually termed) the Common Law. The origin of equity may be thus stated:—The ancient structure of our national jurisprudence, whatever its other merits, was very defective in compass and enlargement of view. It paid no attention to several matters which it is incumbent on a civilised judicature to deal with, and to others it applied maxims too strict to satisfy the idea of justice in an advanced state of society. Its judicial remedies were also cumbersome and limited in character. Thus (to quote from Mr. Justice Story's *Treatise on Equity*), a Court of Equity has jurisdiction in cases where a plain, adequate, and complete remedy cannot be had at common law. The remedy must be plain, for if it be doubtful and obscure at law, equity will assert a jurisdiction. It must be adequate, for if at law it falls short of what the party is entitled to, that founds a jurisdiction in equity; and it must be complete, that is, it must attain the full end and justice of the case; it must reach the whole mischief, and secure the whole right of the party present and future—otherwise equity will interpose and give relief. The jurisdiction of a Court of Equity is sometimes concurrent with the jurisdiction of the courts of law, sometimes assistant to it, and sometimes exclusive. It exercises concurrent jurisdiction where the rights are purely of a legal nature, but where other and more efficient aid is required than a court of law can afford. In some of these cases courts of law formerly refused all redress, but now will grant it. For, strict law comprehending established rules, and the jurisdiction of equity being called into action when the purposes of justice rendered an exception to those rules necessary, successive exceptions on the same grounds became the foundation of a general principle, and could no longer be considered as a singular interposition. Thus, law and equity are in continual progression, and the former is constantly gaining ground upon the latter. Every new and extraordinary interposition is by length of time converted into an old rule; a great part of what is now strict law was formerly considered as equity, and the equitable decisions of this age will unavoidably be ranked under the strict law of the next (Professor Millar: *View of the English Government*). But the jurisdiction, having been once acquired at a time when there was no such redress at law, is still retained by the courts of equity. The Court of Chancery was the principal court for equitable relief, but now by the amalgamation of the Courts of Justice, the jurisdiction formerly exercised by the Court of Chancery is vested in and exercised by the Chancery division of the Supreme Court. [Justice, Courts of.]

Equivalent Weights. The atoms of different elements have a varying power of combination with other elements. [Atomic Theory.] Thus one atom of chlorine can combine with one atom of hydrogen, while one atom of oxygen can combine with two, and an atom of carbon with four hydrogen atoms. This power is known as the *valency* (q.v.) of the atom. Thus chlorine is *monovalent*, oxygen *divalent*, nitrogen *trivalent*, and carbon *tetravalent*. The atomic weight [Atomic Theory] of an element divided by the valency gives what is known as the *equivalent weight*—*i.e.* the weight which can unite with or is equivalent to the part by weight of hydrogen. This can in most cases be found without any regard to theory, thus 35·4 parts chlorine can unite with 1 of hydrogen, and with 39 of potassium. Hence 39 parts of potassium are equivalent to 1 of hydrogen—*i.e.* the equivalent weight of potassium is 39. This being the statement of an experimental fact, and not depending upon any theoretical basis, the equivalent weights were for a long time used in preference to the atomic weights, and still are so used by a section of French chemists. Owing, however, to a variable valency many elements possess variable equivalent weights, and by far the majority of chemists have discarded the older system.

Era, a period of time either noted for some special occurrence, or a series of years reckoned from some particular, generally historic, event. Thus we speak of the Christian, the Persian era.

Erard, Sébastien (1752–1831), a great musical instrument maker, was born in Strasbourg. He went to Paris when eighteen years old, and joined with his brother to make pianofortes, which, by reason of their excellence and superiority to anything of the kind then known, brought the brothers much renown. The Revolution drove him from France, and he set up a factory in London. He invented the double movement for the harp and for the piano, and made other improvements in the former instrument.

Erasmus, DESIDERIUS (1467–1536), a noted Low Country scholar, born at Rotterdam, his father being one Gerard of Gouda, and his mother the daughter of a physician. The pathetic history of his parents has been well set forth by Charles Reade in his novel *The Cloister and the Hearth*. Beginning as a choir-boy of Utrecht cathedral, he afterwards went to school at Deventer, where he made marvellous progress. When he was 14, his parents being dead, he entered a monastery, and, against his inclination, entered the order at 17, soon after, however, going to Paris to complete his studies. He there gave lessons to Englishmen, to Lord Mountjoy among others, and this nobleman gave him a pension. He visited England, and then returned to Paris, and went to Italy, becoming a Doctor of Theology at Bologna. Having received from the Pope a dispensation from his monastic vows he went to Venice, Padua, and Rome, and finally yielding to the wishes of his English friends, he came to that country, being high in favour with Henry VIII., and enjoying the friendship of the greatest men of the time, notably Dean Colet and Sir Thomas More. He lectured on Greek in Oxford for a time, and then travelled in Germany and the Low Countries, and finally went to Basel, where his works were published, and where he died. His tomb still exists in the Calvinist church there. Besides being one of the most learned men of his age, he had great wit, prudence, and knowledge of the world, and his tastes led him to prefer a literary life to the turmoil of controversy or office, and his wisdom made the bigotry of the time hateful to him. His love of truth made him see more than one side of the questions that agitated the time, and exposed him to the charge of indifference. He edited many classics, and an edition of the Greek Testament, besides writings philological and theological. His *Praise of Folly* is well known, and extracts from his *Colloquies* have been used as school texts.

Erasure, the alteration of a deed or document by "shaving" or "scraping" any part of it. When this is done to any material part after execution, the deed is invalidated. In the case of deeds an unexplained alteration is presumed to have been made at or before execution; but this is, of course, open to rebuttal. An immaterial alteration has no effect in avoiding the instrument. As regards wills, alterations therein are disregarded by the Court in granting Probate, unless they are authenticated by the signatures of the testator and witnesses, or unless the fact of their having been made before execution can be proved.

Eratosthenes (born 276 B.C.) was a man of letters in the time of the Ptolemys, being a native of the African city Cyrene. He was librarian at Alexandria, and did much for science. He discovered the obliquity of the ecliptic, made researches concerning the size of the earth, made a system of mathematical geography, and wrote a work on the constellations. Fragments of his geographical works, besides his work on the constellations, have been published.

Erbium, a rare metallic element, atomic weight 166, which occurs with other metals in a few rare minerals. It forms an oxide Er_2O_3, and its salts resemble closely those of Yttrium and Terbium.

Ercilla y Zuniga, DON ALONSO DE (1533–1596, or thereabouts), a Spanish soldier and poet. When quite young he was brought to the court of Charles V., and became page to the infant Don Philip, whom he accompanied in his travels in Europe, and when he came to England to marry Queen Mary in 1554. He then accompanied an expedition against the revolted Araucanian Indians of Chili, and in the intervals of the fighting, in which he bore his full share, he worked up the incidents of the campaign into an epic poem in octave measure, half poem and half chronicle. The poem is mentioned by Cervantes, and was laid under contribution by Lope de Vega, and has been translated into Italian and into French.

Erckmann-Chatrian, the compound name of two French authors, who collaborated in writing some well-known French novels setting forth chiefly the vicissitudes of Lorraine, of which they were both natives. Émile Erckmann was born in 1822, and followed the profession of the law, while Alexandre Chatrian was born in 1826, and was by turns a glass-blower, a tutor, and a railway-clerk. He died in 1890. Among the best known of their works are *Madame Thérèse*, *L'Histoire d'un Conscrit*, *Siège de Phalsbourg*, *Waterloo*, and *L'Histoire d'un Plébiscite*. *Le Juif Polonais* and *L'Ami Fritz* have been dramatised, and are well known to London audiences, especially the former under its English title of *The Bells*, the most successful piece of Mr. Irving.

Erebus, an active volcano in Victoria Land, in the great Southern Ocean. It was discovered by Ross in 1841, and he called it after one of the ships composing the expedition.

Erechtheus, called also ERICHTHONIUS, a mythological character of ancient history. He was a hero of Attica, and introduced into Athens the worship of Athene. The Erechtheum was erected in his honour, and the Athenians were sometimes known as *Erechthidæ*.

Erfurt, a Prussian town on the Gera, in Saxony, 13 miles W. of Weimar, and the capital of a government of the same name containing 1,263 square miles. In the 15th and 16th centuries it enjoyed a great degree of freedom, being almost independent, and was a noted commercial centre by reason of its woollen and linen manufactures, and it had a famous university, which was suppressed by Prussia in 1816. It still has manufactures of cotton and woollen goods, leather, shoes, candles, ironmongery, brandy, and liqueurs. In the tower of its Gothic cathedral is a famous bell, which weighs 275 cwts. Luther lived here as a monk, and his cell used to be shown, but it has been burnt along with the house that contained it. The town was bombarded and taken by the Prussians in 1813, and was granted to them by the

Congress of Vienna in 1814. Napoleon, Alexander of Russia, and some of the German sovereigns held a congress here in 1808.

Erg, in *Physics*, the expression used to signify the amount of work done by one dyne (q.v.) acting through one centimetre (q.v.).

Ergot (from the Old French *argot*, a cock's spur) is one stage in the development of *Clariceps purpurea*, a fungus belonging to the order Pyrenomycetes, which attacks the pistils of grasses and sedges, but especially of rye, *Secale cereale*. It gets its common name, and that of *Secale cornutum*, or "spurred rye," used in pharmacy, from its spur-like form. Its ascospores are filiform, and on germinating, produce hyphal germ-tubes at several points. If these come in contact with the ovary of a grass they penetrate it, covering it with a felted, white "hymenium." This bears numerous cylindric "sterigmata," or "basidia," each bearing a spherical "gonidium" or "acrospore" at its apex. A sugary juice or "honey-dew" oozes out of deep furrows in the attacked ovary, carrying with it the gonidia, and is greedily eaten by insects, in which method this slimy stage, formerly described as a distinct genus under the name *Sphacelia*, is propagated. Each gonidium is capable of reproducing the sphacelia. The mycelium at the base of the ovary next forms a more compact mass or "sclerotium," which becomes dark-violet externally and grows into the spur-shaped mass or "ergot," sometimes over an inch in length. This generally rests till the following autumn or spring, and then gives rise to several "stromata," each consisting of a short stalk and a globular head or "capitulum." Sunk in the outer surface of these heads are the numerous flask-shaped cavities or "perithecia," in which are the club-shaped "asci." Each ascus contains several of the filiform ascospores. The preparations of this drug are a liquid extract, infusion, and tincture. It is sometimes administered hypodermically in the form of the *injectio ergotini hypodermica*. Ergot possesses the property of stimulating unstriped muscle to contraction, and is employed in checking hæmorrhage, and to promote contraction of the uterus. A curious group of symptoms known as "ergotism" sometimes occurs in those who have eaten rye bread contaminated with ergot. In such persons gangrene affecting the extremities is one of the most marked phenomena.

Eric, the name of many kings of Sweden, the last of them being the son of Gustavus Vasa. He succeeded his father in 1560, but his tyranny, and his marriage to a peasant girl, led to a rising headed by his two brothers, John and Charles. Eric was deposed, and died in prison in 1577. His tyrannical habits apart, he seems to have been a patriotic ruler, who did much for law, commerce, art, and religious freedom, and created a new Swedish nobility.

Erica. [Heath.]

Ericsson, John, engineer, was born on July 31, 1803, at Langbanshyttan, Wermeland, Sweden, and after having been employed in the survey of the Baltic and North Sea Canal, entered the Swedish army. In 1826 he visited England in order to introduce one of his earliest inventions, the caloric engine. He soon afterwards resigned his commission, and devoted himself entirely to mechanical pursuits. In 1836 he successfully applied the screw propeller for the purposes of navigation, and in 1839 migrated to New York, where he built the *Princeton*, the first steam warship having her machinery below the water-line, and so out of the reach of shot. He exhibited very numerous inventions at the Great Exhibition of 1851. A few years afterwards, during the American Civil War, he built the famous *Monitor*, the first ironclad with revolving turrets and with a minimum of freeboard, and her success at the battle of Hampton Roads, where she drove off the *Merrimac*, made Ericsson's name known to all the world. He subsequently employed his great abilities in perfecting a solar engine, and in designing torpedoes, and submarine guns. He lived in America until his death in 1889, but his body was sent in an American man-of-war to his native country, and there buried with much pomp. His elder brother, Nils (1802–1870), was also a distinguished engineer, and is chiefly remembered for his work in connection with railways and canals.

Erie, a city and port on Presqu'ile Bay, on the south shore of Lake Erie, in the state of Pennsylvania, United States, 300 miles N.W. of Pennsylvania, with which it communicates by a railway. The harbour is good, and there is a large trade in coal, iron, petroleum, and farm produce. There are foundries, blast-furnaces, and other iron-works, oil refineries, wood factories, breweries, and tanneries.

Erie, Lake, one of the great group of North American Lakes, lies between Lake Huron and Lake Ontario. Its direction is N.E. and S.W., between lat. 41° 30′ and 42° 50′ N., and long. 78° 53′ and 83° 25′ W., its southern shore being in the United States and its northern in Canada. Lakes Superior, Michigan, Huron, and St. Clair drain into it by way of the Detroit and St. Clair rivers in the S.W., and its own waters flow into Lake Ontario by the Niagara river in the N.E. Of its several islands only one—Point Pele—is inhabited. With an area of 9,600 square miles, it has a length of 265 miles and a breadth of 63 miles in the centre, has an extreme depth of 45 fathoms, is 565 feet above sea-level, and 30 feet below the level of Lake Huron. Its navigation is difficult and dangerous in stormy weather, as readers of Fenimore Cooper's *Pathfinder* will remember. The banks vary in height up to 100 feet, and there is a considerable traffic upon it. The chief harbours are Buffalo, Erie, and Cleveland in the United States, and Port Dover, Port Stanley, and Barwell in Canada.

Erigena, Johannes Scotus, a 9th century scholar and metaphysician, born in Ireland or in Scotland. He lived chiefly in France, where Charles the Bald placed him at the head of the palace school, and employed him to translate the Greek of the supposed Dionysius the Areopagite

into Latin, and to compose a controversial treatise on *Predestination and Freewill*. This and his *De Divisione Naturæ* were condemned by the Church on the ground of their pantheism. The place and date of his death are unknown. He is ranked as one of the founders of Realism.

Erivan, a fortified town in Transcaucasia, capital of a government of the same name, containing 10,740 square miles, on the left bank of the Sanga, 30 miles N.E. of Mount Ararat. The town is important as being upon the caravan route between Russia and Persia, and it has manufactures of cotton, earthenware, and leather. There is a castle on the top of a hill, upon which part of the town is built, and there are some Armenian churches, mosques, and a bazaar.

Erlangen, a Bavarian town in a plain, 10 miles N.W. of Nürnberg, almost rebuilt in the early part of the 18th century after being almost destroyed by fire. It is square, with streets at right angles, and has seven gates. French refugees settled here in the 17th century, and gave a great impetus to the manufactures, and there are several breweries. It has three important churches, an old castle, a stadthaus, a theatre, and a university, and there are good gardens and walks in the suburbs.

Erlau, a Hungarian town on the Eger, 65 miles N.E. of Pesth. It is the see of an archbishop, and has a cathedral, an archbishop's palace, a ruined castle, a monastery, a courthouse, and a hospital. On the neighbouring hills are many vineyards, which produce good red wines, and there are two noted hot springs. There are manufactures of linen and woollen cloth, leather, shoes, and harness.

Erlking (Ger. *Erlkönig*), erroneous forms for elf-king and *Elfenkönig*=king of the elves. The German form, introduced by Herder, was made popular by Goethe's ballad. [FAIRIES.]

Ermine (*Mustela erminea*), a small vermiform carnivorous mammal allied to the weasel (q.v.), from which it chiefly differs in its coloration and its greater size. It is generally distributed in the higher latitudes of the northern hemisphere, and occurs in the southern parts of Britain, and in this country it is called the stoat. In summer the upper parts vary from yellowish to mahogany brown, and the under parts are white tinged with sulphur yellow, while the throat is pure white. The general hue of the winter dress is white, with tinges of sulphur yellow. The tail is always tipped with black. The total change only occurs in higher latitudes, whence the ermine fur, used chiefly for trimming state robes, is imported. The ermine feeds principally on rats, water-voles, and rabbits, but does not disdain birds, and sometimes it invades the poultry-yard.

Erne, any species of Haliaëtus, a genus of eagle in which the legs are not feathered. There are seven species, almost universally distributed, being absent only from South America. The Common Erne, or White-tailed Eagle (*H. albicilla*), is a rare British bird found only in the extreme north of the island, though it is widely distributed in the north of Europe and Asia. It is about three feet long, with brown plumage, which is lighter on the head than elsewhere, and in adult birds the tail is white. The White-headed or Bald Eagle (*H. leucocephalus*), the emblem of the American Union, is slightly smaller than the British species. Full-grown birds have the head and neck, as well as the tail, white; the rest of the plumage is brown. All the species frequent rocky coasts or wooded ground near inland lakes, feeding on birds and small mammals, like the true eagles, but supplementing the diet with fish, which some species obtain by robbing more expert fishers. This evil propensity in the bald eagle occasioned Franklin's regret that it should have been chosen by his countrymen as the national emblem.

Erne, LOUGH, in Fermanagh, Ireland, is really an expansion, or rather two expansions, an upper and lower, of the river Erne, which rises in the county of Longford and flows N. through the county of Cavan, and after forming the lough flows into Donegal Bay. The upper lake is 12 miles long by 2 broad, has many islands and flat marshy shores. The lower lake is 15 miles long by 5 broad, and has lofty shores with ruined castles on some of the heights. Trout, salmon, and other fish are abundant.

Ernesti, JOHANN AUGUST (1707–1781), a German theologist and grammarian, was born in Thuringia, and studied at Wittenberg and Leipzig, devoting himself especially to ancient literature and philology. In 1742 he was appointed professor of ancient literature in the Leipzig University, and in 1759 professor of theology. He was noted for his biblical exegesis and criticism, and still more for his editions of the classics. His elegant Latin style gained him the name of "the German Cicero."

Erpenius (VAN ERPEN), THOMAS (1584–1624), an Orientalist, born at Gorkum in Holland. At Leyden he studied Oriental languages under Joseph Scaliger, and made the acquaintance of scholars during his travels over Europe. In 1612 he became professor of Arabic and other Oriental languages at Leyden, and set up an Oriental press. He was also professor of Hebrew, Oriental interpreter to the States-General, and was employed by the King of Spain to read Moorish inscriptions. He published Hebrew and Arabic grammars, and a history of the Saracens, and was contemplating other works of a similar nature when death overtook him.

Errantia, a sub-order of worms belonging to the Polychæta (q.v.), and including all those members of this order which are free and carnivorous; in the second sub-order, or Tubicola, the worms all live in tubes and are vegetarians. The principal families included in this sub-order are the Sea-mice (*Aphroditidæ*) and the Nereids (*Nereidæ*).

Error, a fault in the pleadings or process or judgment in an action upon which formerly a writ of error was brought by the complaining party. The Judicature Acts abolished proceedings "in error," and substituted an appeal in all cases where the Court of Appeal had occasion to deal with what

had taken place in the High Court, and they have given to the Appeal Court much more elastic powers than were exercised in the previous Court of Error, having provided in effect that the Court of Appeal shall have all the powers and duties as to amendment and otherwise of the Court of First Instance, with full discretionary powers to receive further evidence (not raising an altogether new and inconsistent case) upon *questions of fact*, and generally to give such judgment as ought to have been given in the High Court, and the Court of Appeal may also thus deal with any order made in the action. Special provisions are made regulating the cause and manner of appealing. As to criminal cases—after a judgment given against the prisoner either at the assizes or sessions, if there be a substantial defect in the indictment, or error apparent in the Record, such judgment may be reversed by the Queen's Bench Division of the High Court. But the Attorney-General's fiat must be first obtained, which in misdemeanours, on sufficient cause shown, is granted as a matter of course, but in felonies is granted only *ex merâ gratiâ*. The Attorney-General may confess error, and so consent to a reversal of the judgment.

Errors. Observations are of various kinds, and require different senses. Thus observations of length are most generally done by sight; in measuring the length of a table, a scale or rule of known length is placed in contact with the table and a comparison effected by sight. They may be done by the sense of touch also; if a bar is to be turned in a lathe so as to be exactly one inch in diameter, it is convenient to test its diameter with a pair of callipers opened out to one inch, and the sense of touch helps to compare the two. Again, observations of time are usually done by sound, though other means may also be adopted. But on whatever sense the observation depends, absolute accuracy cannot be obtained. The sense is not sufficiently refined, nor are the instruments. The first introduces what are called errors of observation, the second errors of adjustment. The latter may be eliminated when careful testing of the instrument has been effected and an estimate of their errors obtained; or they may, in a sense, eliminate themselves by repeating the observation in different ways and taking the average result. Certain errors of observation are fortuitous, and there is as much likelihood of an error one way as the other. Thus if a hundred average men take a measurement of the same length to one-tenth of an inch it will probably be found that they differ among themselves as to the correct result. But there will be about as many below the average as there are above. The average is the best result that can be taken, though the fact that there is a difference of result shows that this answer cannot be taken as perfectly correct. The majority of the hundred answers will closely approximate to the average, and large errors will occur in but few cases. The method of Least Squares (q.v.) shows to what degree of accuracy this average may be expected to be correct. Personal errors that are not fortuitous generally admit of elimination in the same way as do errors of adjustment, *i.e.* either by determining the *personal equation* (q.v.) of the observer, or by repeating the observation in different ways and taking the average.

Ersari, a large division of the Turkoman nation, whose territory stretches along the left bank of the Middle Oxus, and whose chiefs recognise the political authority of the Khan of Bokhara. They appear to be increasing in numbers, having advanced from 50,000 tents and 250,000 souls, Vambéry's estimate in 1875, to 60,000 tents and 300,000 souls, General Obruchef's estimate in 1886. From their geographical position the Ersari are commonly known as the *Lebab Turkomans*, that is, "River Turkomans."

Erskine, Ebenezer (1680–1756), a Scottish clergyman who founded the Secession Church of Scotland. He studied at the University of Edinburgh, and was appointed pastor of Portmoak in Fife in 1703, and stayed there 28 years, removing afterwards to Stirling. He left behind sermons which were published in five volumes after his death.

Erskine, the Hon. Henry (1746–1817), a noted Scottish barrister, born at Edinburgh, was a son of the Earl of Buchan. His great talents won for him a high place in the profession, and his other qualities caused him to be much esteemed. Being a Whig he was appointed Lord Advocate in the Rockingham administration, but on its fall he suffered professionally on account of his political views. In 1806 he was again Lord Advocate and M.P. for the Dumfries burghs. The latter part of his life he passed in retirement through ill-health.

Erskine, John (of Carnock) (1695–1768), a Scottish jurist and professor of Edinburgh University. He became an advocate in 1719, and professor of Scots law in 1737. In 1754 he published *Principles of the Law of Scotland*, which was much esteemed as a text-book. He resigned his professorship in 1765, and devoted himself to writing his *Institute of the Law of Scotland*, which was published after his death, and new editions of which, brought down to date, are still highly valued.

Erskine, John, D.D. (1721–1803), son of John Erskine, was intended for the legal, but was drawn by his tastes to the clerical profession. In 1758 he was appointed to the New Greyfriars Church at Edinburgh, and in 1767 to Old Greyfriars. He headed the Evangelical party in Scotland, and for his personal character was much esteemed even by his opponents, who were led by Dr. Robertson. Scott pays a compliment to his eloquence in *Guy Mannering*, where Mr. Pleydell takes the Colonel to hear him on Sunday morning. He left behind him controversial writings and some moderate Calvinistic sermons.

Erskine, Thomas, Lord (1750–1823), brother to the Hon. Henry Erskine mentioned above, was a renowned advocate, and less renowned Lord Chancellor. After an education at the Edinburgh High School and St. Andrew's University, he served as a midshipman in the navy for four years, and then

in the army for six years. In 1777 he entered at Trinity College, Cambridge, and at Lincoln's Inn, and in 1778 he was called to the bar, where he achieved such success as to justify his taking silk in 1783. His forensic skill at the trial of Admiral Keppel caused the electors of Portsmouth to return him to Parliament, and to keep him there till he became a peer. He was a great advocate of the rights of juries, and his attitude in the libel trial of the Dean of St. Asaph brought him into collision with Mr. Justice Buller, who had been his trainer in special pleading. His defence of Mr. Stockdale was a great oratorical exhibition. For defending Thomas Paine, in 1792, he lost his position as Attorney-General to the Prince of Wales, but in 1802 he was restored to the post, and in 1806 Lord Grenville made him Lord Chancellor, and he became a peer. This was on the whole a misfortune for him, since the administration was short-lived, and it was against etiquette for him to return to the bar. Moreover, his powers as an advocate were not equalled by his powers as a judge. Among his literary works were a pamphlet upon the war with France, the editing of some State trials, a preface to Fox's speeches, and a political romance. Many of his speeches at the bar have been published, notably, in Chauncey Goodrich's collection of *British Eloquence*, as well as separately.

Erubescite, or BORNITE, $3Cu_2S_3,Fe_2S_3$, is a very valuable ore of copper, of which metal and iron it is a sulphide. It crystallises in the Cubic system; but is most commonly massive. It is of a pale reddish-yellow colour, or varies from copper-red to pinchbeck-brown, but tarnishes so rapidly, on exposure to red, brown, and then violet, or blue, that it is known as "variegated" or "purple copper-ore," or in Cornwall as "horse-flesh ore." It has metallic lustre, a greyish-black streak and an uneven fracture, is brittle, and has a hardness of 3 and specific gravity 4·5 to 5·5. When heated it gives off sulphurous fumes, and can be reduced to a brittle magnetic bead. It dissolves in nitric acid, the sulphur remaining as a residue. It occurs at Dolcoath and elsewhere in Cornwall, is plentiful in Chili, Peru, and Mexico, and is found at Killarney, and, associated with malachite and baryte, in Connecticut.

Erulars (*Irulas*), an aboriginal tribe of the Nilghiri Mountains, South India, of extremely dark complexion, as indicated by their name, which in Tamil means "black as night." They occupy the foot of the hills just below the Kurumbas, and in their physical appearance are intermediate between the Kurumbas and the Hindu Pariahs (low castes) of Madras. There are two classes, the *Urali*, or chief, and the *Kurntali*, or peasants, who raise a little corn scarcely sufficient for the daily wants of the tribe. The Erulars occupy an extremely low stage of culture, but although living in a promiscuous state the two classes always keep entirely aloof. Their language is a Tamil dialect mixed with Kanarese and Malayalam elements, and at the census of 1891 they numbered 41,000.

Eryonidæ, a family of lobsters (Macrura) of which the type-genus *Eryon* occurs in the Jurassic rocks; some remarkably well-preserved examples have been found in the Solenhofen Slate.

Erysipelas (from two Greek words signifying a red skin), or ST. ANTONY'S FIRE, a febrile affection associated with inflammation of the skin. The affected part (usually the head or face) is swollen, red, hot, and raised above the surrounding skin. Erysipelas usually occurs in connection with a wound (traumatic erysipelas). It is sometimes attended with high fever and much constitutional disturbance. One attack of the disease does not, as in the case of scarlet fever, measles, etc., protect the individual against subsequent attacks, but on the contrary, seems to render him predisposed to further occurrences of the malady. Erysipelas appears to be due to the invasion and growth within the body of a germ, the *micrococcus erysipelatos*. The disease used to be of common occurrence where large numbers of persons suffering from wounds were grouped together, but of late years the advances made in antiseptic surgery have greatly minimised the mischief formerly wrought by the disorder in hospitals. The treatment of erysipelas is in the main that of other fevers; depletion is badly borne, and a liberal diet should be administered. Preparations of iron are usually given, and the local applications employed are poultices and simple ointments; or a dry powder such as a mixture of zinc oxide and starch is dusted on to the inflamed part.

Erythema, a skin disease in which diffuse redness of the cutaneous surface occurs. The term is very loosely applied. Erythema often occurs in rheumatic subjects. A well-marked form of erythema is *Erythema nodosum*, in which affection exceedingly painful, reddened, and raised patches are noticeable, usually involving the skin of the leg over the shin bone.

Erythrite, Erythrine, or COBALT-BLOOM, $Co_3As_2O_8 + 8H_2O$, a hydrous arsenate of cobalt, occurs with other ores of that metal, and is used in the manufacture of smalt. It crystallises very regularly in modified prismatic forms belonging to the Oblique system with perfect cleavage yielding flexible laminæ; but is more often found earthy. It is crimson or peach-blossom red, with a paler streak drying to lavender-blue; translucent, vitreous to adamantine in lustre on some faces, but pearly on those of perfect cleavage. It is sectile, having a hardness from 1·5 to 2·5 and a specific gravity about 3. On heating it gives off water and a sublimate of arsenic: it colours the flame light-blue, gives a deep blue bead with borax and a rose-red solution in hydrochloric acid. It is found in Cornwall, near Alston in Cumberland, at Schneeberg in Saxony, and elsewhere.

Erythrol (ERYTHRITE), a tetrahydric alcohol of the formula $C_4H_{10}O_4$, its constitution being represented by $CH_2OH.CHOH.CHOH.CH_2OH$. It forms large dimetric crystals and, like most polyhydric alcohols (*comp.* glycol, glycerine, sugar, etc.), has a sweet taste. It occurs in combination in various lichens and in Protococcus. It undergoes fermentation under the influence of certain

bacteria, yielding butyric acid ($C_4H_8O_2$) as a product.

Erzerum, a city of Turkish Armenia, 100 miles S.W. of Trebizond, forming the chief outpost against the Russians in that direction. The town consists of a central, strongly-walled citadel, and surrounding suburbs. There are many mosques, Armenian churches, bazaars, and caravanserais, and the streets are, for the most part, narrow and squalid. There are many manufactures of copper and iron goods, and the position of the town on the great roads between E. and W. leads to considerable trade. The inhabitants are chiefly Turks, Armenians, and Persians. There was a fortress here in the time of Theodosius, and the name Erzerum is a corruption of words meaning *Arsen of the Romans*. It became Turkish in 1517, and in 1829 was taken by the Russians, who again besieged it and held it for a time in 1877–78.

Erzgebirge, a mountain chain between Saxony and Bohemia, rising to a height of about 4,000 feet. The mountains are rich in minerals, whence their name, which means ore-mountains. Among the minerals are arsenic, cobalt, copper, iron, lead, and silver, and the formations are chiefly granite and gneiss, with clay slate, basalt, and, in the Bohemian part, brown coal.

Eschar, a slough, or portion of dead tissue. An *Escharotic* is a form of application used for artificially producing an eschar.

Eschara, a genus of marine Bryozoa (q.v.), including those which form large calcareous leaf-like colonies. It has, however, been found that representatives of many different genera and families have been included under this term, and the genus has consequently been abandoned.

Eschatology (Greek *eschatos*, last), that part of theological science which attempts to establish a theory of the lot that awaits man in a future world, and which deals with what are called the four last things: Death, Judgment, Heaven, Hell.

Escheat, from the Norman-French *eschet*, which is from the word *eschier* or *eschoir*, to fall; for an escheat is a casual profit, which falls to the lord of the fee, from whom, or from whose ancestor, the estate was originally derived, taking it as *ultimus hæres* upon the failure, natural or legal, of the intestate tenant's family. It differs from Forfeiture (now abolished for treason or felony) in that the latter is a penalty for a crime personal to the offender, of which the Crown is entitled to take advantage by virtue of its prerogative; while an escheat results from tenure only, and arises from an obstruction in the course of descent. It had its origin in feudal times; while forfeiture affects the rents and profits only, escheat operates on the inheritance. Escheat follows, then, on default of heirs, when the tenant dies without any lawful and natural-born relations on the part of any of his ancestors, or when he dies without any lawful and natural-born relations on the part of those ancestors from whom the estate descended, or where the intestate tenant, having been a bastard, does not leave lineal descendants, since he cannot have any collateral descendants. It also arose from corruption of blood (now abolished by 33 and 34 Victoria, c. 23), when the tenant had been convicted of treason or felony. For the protection of beneficiaries of estates the statute law has made an exception to the general law of Escheat in the case of a trustee or mortgagee dying intestate and heirless (13 and 14 Victoria, c. 60), and by the Intestates' Estates Act, 1884, equitable estates and interests in incorporeal hereditaments (which prior to that Act did not escheat) are subject to the same law of Escheat as legal estates in corporeal hereditaments. The Intestates' Estates Act, 1884, also provides for the waiver by the Crown of its right by escheat in favour of the intestate's family, or of any person considered or adopted as part of his family as pointed out by the Statute 59 George IV., c. 94.

Eschscholtzia, a genus of herbaceous plants belonging to the poppy family, natives of California, named after the German traveller and naturalist, Johann Friedrich Eschscholtz (1793–1831). The calyx is "calyptrate," coming off like a cap; and there are four petals and an elongated siliqua-like pod of two carpels with parietal placentation. *E. californica*, the best-known species, has finely divided, glaucous leaves and yellow petals, orange at the base.

Eschweiler, a town at the junction of the Inde and Dente, in Rhenish Prussia, 9 miles N.E. of Aix-la-Chapelle. The principal industries are iron-works, glass, machine-making, and woollen, silk, velvet, lace, and leather manufactures. There are iron and lead mines in the neighbourhood.

Escobar y Mendoza, Antonio (1589–1669), a Spanish casuist, born at Valladolid, and educated by the Jesuits, whose order he entered at an early age. He became renowned as a preacher, and preached daily for 50 years. His writings made 40 folio volumes. Among the chief of them are *Summula Casuum Conscientiæ*, *Liber Theologiæ Moralis*, and *Universæ Theologiæ Moralis Problemata*. He also wrote some Latin poems. He was an advocate of the doctrine of expediency, and his views were attacked by Pascal in his *Provincial Letters*.

Escurial, The, a palace of the Kings of Spain, now falling to decay, situated 2,700 feet above the sea level in the Sierra Guadarrama, between old and New Castile. It was built in fulfilment of a vow by Philip II. between 1563 and 1584, and was intended to represent the gridiron which was the instrument of the martyrdom of St. Lawrence, to whom it was dedicated. Besides the palace, it formerly contained a monastery and a chapel, the palace and chapel being, so to speak, in the handle of the gridiron. The parallelogram which represents the body of the instrument is 744 feet by 580. Towers of 200 feet in height at the extremities represent the feet, and the tower of the church is 330 feet high. The Kings of Spain are buried beneath the church. There is a good library, with

many Greek and Arabic MSS., and there is a very fine collection of paintings.

Esk, the name of several rivers in Scotland, the word meaning *water*. Of the seven Scottish rivers of the name, three are in Dumfries, part of which has the name of Eskdale, two are in Forfarshire, and two in Edinburghshire.

Eskimo (ESQUIMAUX), a North American people, who are thinly spread over the whole of the Arctic regions from Behring Strait to Labrador and both sides of Greenland, but who are almost exclusively confined to the seaboard, scarcely anywhere ranging more than 100 or 150 miles inland. Although everywhere presenting great racial and linguistic uniformity, they have no general national name, calling themselves *Innuit* (sing. *Innok*) in parts of Alaska and the Melville Peninsula; *Chiglit* (sing. *Chiglerk*) about the Lower Mackenzie; *Agertit* (sing. *Aggut*) on the west side of Hudson Bay; *Karalit* or *Kalalit* in Greenland; all of these terms simply meaning "men," "people." *Eskimo*, the name given to them by their Algonquin neighbours, has reference to their taste for uncooked food, being derived from *aski* = raw, and *mowew* = he eats, whence *askimow* = he eats raw meat, or *askimowew* = he eats it raw. Physically they stand quite apart from the other American aborigines, resembling the Chukchis, Samoyedes, and other primitive Siberian peoples in their squat, thick-set figures, round, flat face, high cheek bones, narrow brow, small, broad nose, thin lips, deep-set, oblique eyes, receding chin, yellow-brown complexion. The beard is scant and bristly like the whiskers of a cat (Hayes), and the hair is of the black, lank, coarse texture common to all Mongolo-American peoples. A highly characteristic feature is the dolichocephalic (long) skull, which grows more marked from west to east, reaching its extreme development among the Greenlanders. The height, averaging about 5 feet 3 or 4 inches, varies considerably, and Dale describes the Eskimo studied by him in Alaska as even a tall, fine people, intelligent, shapely, of athletic form, differing, in fact, in most respects from the popular idea of this race. According to Rink, perhaps the best authority on the subject, the original home of the Eskimo was in Alaska, whence they gradually moved along the lines of recent resistance round the shores of the Arctic Ocean eastwards and southwards to Greenland and Labrador. They may have either reached Alaska from Asia across Behring Strait, or, as many suppose, from the interior of North America, the physical differences now separating them from the Redskins being due to long isolation and gradual adaptation to their changed environment. This view is supported by the fact that the language is distinctly of the polysynthetic American, and not of the agglutinating Asiatic type. A few Eskimo groups are certainly found on the Asiatic side of Behring Strait, but these appear to be later immigrants from Alaska, and consequently do not represent the primordial stock of the American Eskimo. Despite the vast extent of their domain, the Eskimo are far from a numerous people, numbering altogether probably not more than 40,000, of whom 12,000 are in Alaska, 4,000 in Labrador, 10,000 in Greenland, and the rest in the intervening Arctic regions. Occupying lands almost destitute of vegetation, all are necessarily fishers and hunters, preying according to the seasons and surroundings on the whale, seal, walrus, otter, beaver, salmon, aquatic birds, the wolf, fox, musk ox, and reindeer. Unlike the Samoyedes and other Asiatic hyperboreans, they have rarely succeeded in taming the reindeer, their only domestic animal being the half-savage Eskimo dog, which is trained to draw the sledges and render them other useful services. The Eskimo are warmly attached to their bleak Arctic homes, where they defy the rigours of the climate wrapped in ample fur or sealskin garments, and generally sheltered in earthen-driftwood or snow huts half-buried in the ground, and roofed with mosses, lichens, and even the skins of wild animals. They display great skill in the construction of these dwellings, as well as in the preparation of their harpoons, household utensils, and especially their boats, of which there are two kinds, the *kayak*, 16 to 18 feet long, and tapering at both ends from about 18 inches in the middle, used only by the men for fishing purposes; and the *umiak*, or family boat, large enough to contain 30 or 40 persons, with which voyages of thousands of miles have been made along the coasts. Although ethnologists speak of Eskimo tribes, the tribal organisation is undeveloped; their small scattered communities are completely independent, recognising no chiefs, scarcely even the paternal authority. Three social divisions, however, have been distinguished: the family; the group of families all residing in one large house in winter, an arrangement confined mainly to Greenland; and the *mute* or village, a mere aggregate of families living together for convenience, but without any political organisation. These mutes are generally named from some local feature, as, for instance, Sikosuilar-mute, "Village of the Iceless Shore," on the Hudson Strait, and then the same term is applied collectively to all the inhabitants, as if it were their common tribal name, whence the numerous "tribes" all ending in *mute* which figure in ethnological works. The Eskimo religion is equally rudimentary, being limited to a belief in witchcraft and malevolent spirits, which have to be conjured or propitiated. If there are any good spirits about, they are harmless, and need no consideration. The Greenland Eskimo—those at least on the west coast—have long been nominal Christians, converted in the 18th century by Danish missionaries, who have reduced their dialect to written form. Many also of the Labrador groups have been evangelised by the Moravian Brethren, whose congregations numbered nearly 1,200 in 1889. These Labrador Eskimos are supposed to be the descendants of the fierce Skrällinger who offered a stout resistance to the Norse settlers in that region in the 14th century. (B. Seaman, *Anthropology of Western Eskimoland*, in *Anthropological Journal*, 1865; Hall, *Life with the Esquimaux*, 1854; Cl. R. Markham, *On the Origin and Migrations of the Greenland Esquimaux*, in *Journal of the Royal Geographical Society*, xxxv.; H. Rink, *Tales and Traditions of the Eskimo*, 1875.)

Eskimo Dog, a half-wild variety of the dog, used in Arctic regions for drawing sledges. It shows traces of its ancestry in its form and colour, and in its wolf-like note and temper.

Eski-Tûrk, that is, "Old Turks," a term often applied to the Kizil-bash Turkomans of Asia Minor, who are quite distinct from the Turkish peasantry of that region. W. Gifford Palgrave describes them as "a sort of eastern Mormonites, with a dash of Persian or Shiah superstition" (*Report on the Province of Trebizond*, 1868, part ii.).

Esne (anciently *Latopolis*), a city on the left bank of the Nile, in the Thebaid, Upper Egypt, 28 miles S.W. of Thebes. The great temple of Esne, one of the best specimens of Egyptian architecture, is now represented by a fine portico of 24 columns, having a zodiac upon the ceiling. Some have thought the temple and its portico to be very ancient, but the prevailing opinion now is that it dates back no farther than the time of the Emperor Claudius, and that the zodiac is even later. The Sennaar caravans use the town as an *entrepôt*, and there are potteries, shawl manufactures, and a cotton mill.

Esocidæ. [PIKE.]

Esoteric (Gk. *esō*, within), an epithet used in philosophy to denote the more abstruse doctrines of a system, which were kept for the special disciples and initiated, and were considered to be above the capacity of those who were allowed to be fitted to receive the more general and *exoteric* (Gk. *exō*, without) principles of the system. Although Aristotle was said to have had esoteric doctrines, he himself only speaks of exoteric discourses, and then probably does not use the word in the sense that has been attributed to it. Pythagoras, too, was said to have had the two parts in his system, and we read of "esoteric Buddhism." Shakespeare uses in a somewhat similar sense the phrase "caviar to the general."

Esots, an Afghan tribe occupying the hills west of Dera Ishmail Khan, said to be of Kakar origin [KAKAR], but now distinct; live mostly in caves, and are amongst the rudest of all the Afghan peoples; two divisions—*Nohzæ*, with six branches; *Mulâzæ*, with seven branches.

Espalier (It. *spalla*, a shoulder, and *spaliera*, a wainscot to lean the shoulder against) is a word used in fruit gardening, sometimes to denote a kind of lattice-work against which fruit-trees, especially apples and pears, are trained as against a wall, and sometimes used to denote such fruit-trees, or even a row of them.

Espartero, BALDOMERO, DUKE OF VITTORIA (1792–1879), a Spanish statesman, was born in La Mancha. In 1808 he entered the Students' Battalion during the War of Succession, and in 1814 he went to South America, where he fought under Bolivar. In 1836 he was again in Spain, and was Captain-General of the Basque provinces against the Carlists, against whom he gained several successes. As a reward for this he was created a grandee of Spain and Duke of Vittoria. From 1840 to 1843 he was regent in place of Queen Christina, after which he came to England for a time. From 1854 to 1856 he was at the head of the government, and in 1870 was even proposed as a candidate for the crown, but in 1870 he threw his lot in on the side of King Alfonso.

Esparto. [ALFA.]

Espinel, VICENTE (1551–1634), a Spanish poet and ecclesiastic, born at Ronda, in the province of Granada. He was educated at Salamanca, and was a friend and patron of Lope de Vega. After serving for some time as a soldier in Flanders he settled down in Madrid. His *Relaciones de la Vida y Hechos del Escudero Marcos de Obregon*, published in 1618, is the supposed autobiography of a toady, and furnished Le Sage with a groundwork of his *Adventures of Gil Blas*. Espinel also wrote poems, using a measure which was called after him. He translated some of the poems of Horace, and he added a fifth string to the guitar.

Espiritu-Santo, a Brazilian province, having Bahia on the N., Rio de Janeiro on the S., and the Atlantic on the E., with a length of 260 miles, a breadth of 120, and an area of 17,312 square miles. There are several rivers flowing into the Atlantic, and the coast, where the climate is healthy and the soil fertile, is populous. The mountains and forests of the interior are inhabited by wild Indians, and are little known. The chief exports are sugar, rum, cotton, and dye-woods.

Esquirol, JEAN-ÉTIENNE (1772–1840), a French physician, who made the insane his special study. He was born at Toulouse, and studied at Paris, and was appointed sanitary officer to the Army of the Pyrenees. He visited the lunatic asylums of France, and in 1811 was appointed physician to the Salpetrière, and in 1823 was made inspector-general of the medical faculty. He wrote much upon madness, mental disease, and lunatic asylums.

Esquiros, HENRI ALPHONSE (1814–1860), a French poet, novelist, and politician, was born in Paris. His first work, *Les Hirondelles*, was published in 1834, followed shortly by a novel, *Le Magicien*, and another, *Charlotte Corday*. His *Evangile du Peuple* was a modernising of the life of Christ, something after the fashion of Mrs. Lynn Linton's *Joshua Davidson*. Imprisoned for his opinions, he wrote *Les Chants d'un Prisonnier*. In 1847 he wrote *Histoire des Montagnards*, and in 1851 *Histoire des Martyrs de la Liberté*. In this year he was expelled from France, and went to Holland and to England, where he became a professor at Woolwich. His sojourn in these countries gave him material for writing *La Néerlande et la Vie Hollandaise* and *The English at Home*. In his latter years he returned to France, and was elected to the Assembly.

Essence (Lat. *essentia*), the informing spirit of a thing; that which makes it what it is. In a metaphysical sense it is equivalent to the real nature of a class as expressed in the definition. In a physical sense it was said to be a quintessence or some fifth thing apart from but underlying

the four elements. The word is used in chemistry generally to denote an alcoholic solution of the essential oil of a substance.

Essenes, a Hebrew sect, whose members were strict in observances, of ascetic habits and mystical tenets, and adopted the monastic life. Some have advanced the improbable theory that Christian teaching originated in the Essenes. Possibly St. Paul meant them when he spoke of "the straitest sect." They held communistic principles with regard to property. Nineteen etymologies have been at different times proposed as to the name. Many of them are said to have become Christian, and to have formed the mystic sect called *Therapeutæ*, and to have first established monasticism in the Christian Church.

Essen-Ili, a main division of the Turkoman nation, who occupy a wide territory in West Turkestan. According to Obruchaff (*Shornik*, iii. p. 80), they number altogether 115,000 souls, all under tents, and subject to Russia.

Essen-on-the-Berne, a town of Rhenish Prussia, 18 miles N.E. of Düsseldorf. It is chiefly noted as the seat of Krupp's gigantic iron and steel works. It is here that are manufactured the steel guns, large and small, that enjoy so great a reputation in the Continental armies. The firm has its own coal and ironstone mines, some of the latter being in Spain. The works cover 1,000 acres, and give employment to an army of workmen, who are treated with great consideration. Besides puddling and rolling-mills, there are manufactures of machinery, boilers, tobacco, and cigars.

Essential Oils are oils obtained by the distillation of various plants, usually with water. They are generally colourless or slightly yellow, of a low specific gravity, inflammable and odorous, and usually undergo alteration by exposure to air. Some appear to exist as such in the plants, but in other cases they are products formed by the alteration or decomposition of complex vegetable compounds. They vary in composition, but generally consist of a mixture of at least two substances—the one oxygenated as an alcohol, acid, or aldehyde, the other a hydrocarbon. They are very largely used for the manufacture of various scents, essences, etc.

Essequibo, the name of a river and of a settlement in British Guiana. The river flows into the Atlantic by a mouth twenty miles broad, but the entrance is partially blocked by sand banks. There are several islands in the river. The settlement is upon the river, and formerly belonged to Holland, but was made over to England in 1814. The country is fertile and well cultivated, its chief products being cocoa, coffee, sugar, and cotton.

Essex, a county on the south-east coast of England, to the north of the Thames, having Suffolk on the N., the German Ocean on the E., and Hertford and Middlesex on the W. It is 60 miles long by a greatest breadth of 45 miles, and contains 1,055,133 acres. The land is flattish, but has gentle hills and dales, save in the south and east, where it is generally reclaimed marsh. Epping Forest (q.v.) has some beautiful woodland scenery. Essex is one of the first farming counties of the kingdom, and is specially noted for its wheat, its beans, and its peas, while other crops are above the average, and it cultivates also caraway, coriander, and teazel. There is much grazing on the marsh lands, and fattening of calves for the London market. Epping and its neighbourhood are famous for cream and butter, and fish are plentiful on the coast; while near Colchester and in the rivers Crouch and Roach there are extensive oyster-beds. Silk, crape, and straw-plait manufactures are the special industries. Besides the boundary rivers Thames, Lea, and Stour, the chief are the Chelmer, Colne, Crouch, Roding, and Blackwater. There are eight parliamentary divisions, returning one member each, and two parliamentary boroughs—Colchester (with one member), and West Ham (with two). The county town is Chelmsford, and then come Colchester, Harwich, a frequented port for the Continent, and Maldon. The county is served by the Great Eastern Railway.

Essex, Robert Devereux, Earl of (1567–1601), a courtier of Queen Elizabeth's time. Educated at Trinity College, Cambridge, he came to court in 1584, and was made Master of the Horse and Knight of the Garter, and commanded the cavalry under Leicester in the Netherlands in 1587, and succeeded that nobleman in the Queen's favour. In 1590 he married Walsingham's daughter, the widow of Sir Philip Sidney. In 1596 he commanded the expedition which burnt Cadiz, and the next year he had a hand in the capture of some Spanish ships. In 1597 he was made Lord-Lieutenant of Ireland, but was unsuccessful in governing the country, and through petulance coquetted with the malcontents of all parties, and when summoned before the Council, resisted and committed overt acts of rebellion, for which he was beheaded in February, 1601.

Esslingen, on the Neckar, a town of Würtemberg in Germany, seven miles S.E. of Stuttgart. It is a walled town, and is defended by a castle. Among its public buildings are a Gothic church, with a tower 230 feet high, two town halls, and an ancient monastery. There are manufactures of machines, philosophical instruments, cutlery, articles in gold, silver, wood, and tin, and there are paper and spinning mills. In the Middle Ages Esslingen was an imperial free town.

Estate, a generic term indicating the extent of the title or interest of anyone in property of any kind. This is the legal signification of "Estate," which is not a piece of land or other property, but signifies the relationship between a man and property. The word was formerly used to signify a man's status or condition in life. It was also used to signify (as it still does) a class or order in the state. The law of England recognises two principal divisions of this subject, viz. *Real Estate* and *Personal Estate*, and in many respects there is a separate law peculiar to each.

Real Estate is an interest in land, and may be aptly treated under three heads: (1) the quantity

of estate, that is, the amount of the owner's interest therein; (2) the time when that interest commences and endures; (3) the quality of the estate, or the way in which it is to be enjoyed.

1. All real estate, not being of copyhold tenure [COPYHOLD], or what are called customary freeholds, is either freehold or less than freehold. Freeholds are freeholds of inheritance, or freeholds not of inheritance. Freeholds of inheritance are either inheritances absolute, called fee-simple, or inheritances limited, called qualified or base fees, or fees conditional. A freehold of inheritance absolute or fee-simple is the largest estate or interest which a man can have. The owner may freely dispose of it to whom he pleases in his lifetime by deed or by will, and if he dies without making any disposition it descends to his heir. A qualified or base fee has some qualification or limit annexed, which may determine the estate, as in the instance of a grant to A and his heirs, "tenants of the manor of Dale." Whenever A or his heirs cease to be tenants of that manor, their estate is determined—that is, at an end. An *estute tail* or conditional fee (popularly known as an entailed estate) is a fee restrained to some particular heirs, exclusive of others, as to a man and the heirs male of his body, by which limitation his lineal heirs, female and collateral, were excluded—hence, the origin of this estate. A freehold not of inheritance is an estate which the owner has for his life only, or the life of some other person, or until the happening of some uncertain events. (As to tenant by curtesy and tenant in dower, *see* CURTESY, DOWER.) Of estates less than freehold there are three descriptions—estates for years, legally known as chattels real, popularly as leaseholds, estates at will, and estates by sufferance. An estate at will arises where a man lets land to another expressly at the will of both parties, or without limiting any certain estate; either party may put an end to the tenancy when he pleases. An estate by sufferance arises where a tenant, who had entered by lawful title, continues in possession after his interest has determined. [LEASE.] All estates may be subject to a condition, or the happening or not happening of some uncertain future event, whereby the estate may be either created or enlarged or defeated. (2) Estates are either in possession or in expectancy. Estates in expectancy are divided into estates in remainder and reversion, and by executory devise or bequest; and, again, remainders are divided into vested and contingent remainders. (3) Estates may be enjoyed in four ways—viz. in severalty or by a single person, in joint tenancy, in coparcenery, and in common. (*See* those titles.) Estates are also legal or equitable. It is a legal estate when the owner is in the actual seisin or possession, and also entitled to the beneficial interest himself, or in trust for some other person. An equitable estate is when some other person, not the person who is the actual and legal owner, is entitled to the beneficial interest of the property, of which that other is in possession. The power of the beneficial owner over his equitable estate is as complete as if he were possessed of the legal estate.

2. *Personal Estate* consists of property, things, or chattels, etc., movable of whatever denomination, whether alive or dead, as furniture, money, horses and other cattle, etc., for all these things may be transmitted to the owner wherever he thinks proper to go, and may therefore be said to attend his person, according to the maxim—*mobilia ossibus inherent*. In many respects (notably on death in the absence of a will) an entirely different law regulates personal estate, including chattels real. The devolution of personal estate is prescribed by the "Statute of Distributions," passed in the reign of Charles II. (22 and 23 Charles II., c. 10). [INTESTACY.]

Este, the name of an ancient Italian family which produced many illustrious men. Among the best-known of them are Alfonso I., who, after joining the league of Cambray and commanding the Papal army, was afterwards opposed to the Pope, and captured the Papal general Fabrizio Colonna. He was for a time restored by Leo X., but was afterwards excommunicated, and took part with Francis I. of France in his war with Charles V., afterwards joining the Emperor, who secured to him his possessions. In the reign of Pope Alexander VI. he married Lucrezia Borgia, by whom he became father of Ercole II., whose wife, Renée of France, favoured Calvin and the Reformers. His son, Alfonso II., imprisoned Tasso in the madhouse for seven years for raising his eyes to the Princess Lucrezia. His cousin and heir Cesare was excommunicated by the Pope and deprived of Ferrara, after which the family steadily declined, and in 1859 the duchy was annexed to Sardinia.

Esterhazy von Galantha, a noble Hungarian family dating from the 13th century. They aided the House of Hapsburg, and did important services to Frederick II. and Leopold I. In the 13th century the family divided into two lines, one of which became extinct in 1838. The name was changed to Esterhazy in 1584 by Francis Terhazy, who was vice-regent of the county of Presburg. This Francis had four sons. The descendants of one of these failed in 1670, but of the houses founded by the other three two received the title of Count in 1683, and Nikolaus, the founder of the third, was made Margrave of Forchestein in 1626.

Esters, a name applied to the class of bodies known as ethereal salts—*i.e.* compounds of an alcohol and acid. It is generally restricted to the ethereal salts of organic acids, and, although formerly not much used except by German chemists, the word is now adopted in English chemical nomenclature.

Esther, a Jewess who was married to Ahasuerus, King of Persia, and whose adventures and danger from Haman, and advocacy of her people, are recorded in the Book of Esther, which, however, is often regarded as altogether apocryphal. Those who believe in its historical accuracy are in doubt whether Darius or Xerxes is spoken of under the name of Ahasuerus.

Estheria, a genus of Phyllopoda (q.v.), in which the animal was protected by a bivalve shell.

It lives in estuaries, and has survived since Silurian times. *Estheria minuta* is one of the commonest fossils in the English New Red Sandstone.

Esthonia, a Russian maritime government having the Gulf of Finland on the N., St. Petersburg on the E., Livonia on the S., and the Baltic on the W., and including Oesel, Dagoe, and some less important islands, the whole area being about 7,600 square miles. The country generally is flat or undulating, except in the north, where there are high cliffs. The climate is healthy though moist; but the soil is not very fertile, a good deal of it being sandy, or covered with gravel and boulders. Some cereals are grown, together with flax, hops, and tobacco. The only river of any size is the Narva, but there are small streams and lakes, and there are pine, birch, and alder forests abounding in game. Fish is plentiful, and there is an export of hides and salt fish, and spirits are distilled and exported. The land is chiefly cultivated by Germans and Danes, but the peasants are Finnish in blood and language. The four districts of Esthonia are under the Governor-General of Riga, and are named Revel, Hapsal, Weissenstein, and Wesenberg.

Esthonians, a historical Finnish nation long settled on the southern shores of the Gulf of Finland, where they give their name to the Russian province of Esthonia; but for centuries they have been mere serfs on the large estates which are owned by German and Danish nobles, though their social condition was much improved by the Imperial edicts of 1804 and 1816. They are first mentioned by the Greek navigator Pytheas (about 340 B.C.) under the name of Æstii, which is evidently the *Eystur* or "Eastlanders" of the Norse chronicles, and they were known to King Alfred (Orosius) by the same name. This Germanic word has even been adopted by the people themselves, who often call their country Eesti-Maa, though the more usual expression is Meie-Maa, "Our Land." The Esthonian confederacy, which held its national assemblies at Rugala, had to recognise the supremacy of the Danes in the 11th century; and in 1347 Waldemar IV., King of Denmark, ceded his rights to the Teutonic Knights, under whose administration German influences became dominant. Nevertheless, the rural classes preserved their nationality and their Finnish language, which is still spoken in two varieties (those of Revel and Dorpat) by about 700,000 Esthonians and their Livonian kindred. But this language, which at one time prevailed throughout the whole of the Baltic provinces, is now extinct in Kurland. Its literature is mainly confined to religious works, chronicles, and national songs, printed chiefly in Dorpat. The Esthonians are nearly all Lutherans, and, although they have been Russian subjects since the Treaty of Nystad (1721), the Russian language and religion have hitherto made little progress amongst them. (H. H. Howorth, *The Finns and Some of their Allies*, in the *Journal of the Anthropological Institute*, 1871; Rutenberg, *Geschichte der Ostsee-Provinzen*, Leipzig, 1860.)

Estoppel, a bar or impediment to the exercise of some right, arising from a man's own act or the act of some person, through whom he claims. There are three kinds of estoppel, viz.:—(1) *Estoppel by record*, as letters patent, pleadings, etc. Thus, in an action against a patentee by his assignee, the patentee is estopped from pleading that the patent is invalid. (2) *By matter of writing* as by deed, etc., parties and privies are stopped from alleging anything contrary to the deed. (3) *By matter in pais* (in the country), that is, transactions not evidenced by record or writing as livery, entry, acceptance of rent, etc. Thus, after acceptance of rent a landlord cannot treat his lessee as a trespasser.

Estover. This word, which is derived from the French *étoffer*, to furnish—*i.e.* stuff—is used to denote certain rights enjoyed by persons having only a limited estate or interest in land, being rights necessary to the enjoyment of that estate or interest. There are three kinds of estovers, viz.:—(1) *Housebote*, being a sufficient quantity of wood for fuel and repairs of the house. (2) *Ploughbote*, being a sufficient quantity of wood for the making and repairing of agricultural implements. (3) *Haybote*, being a sufficient quantity of wood for the repair of fences. Estovers must by law be reasonable; also they must be strictly applied to their respective purposes and to none other. Any excess in the enjoyment or misapplication of the just amount would constitute waste.

Estranghelo, the old Syriac alphabet of square monumental form, which is derived from the Phœnician, and which is itself the parent of the ordinary cursive Syriac script, of the Kufo-Arabic and Syro-Chaldæan. The letters are extremely bold and elegant, and are consequently still much used for title-pages, ornamental work, deeds, and records.

Estreat (from the Latin *extractum*) indicates a copy or extract from the Book of Estreats—*i.e.* the rolls of any court in which the recognisances, amercements, or fines, etc., taken or imposed by such court upon or from an accused person, and which are leviable by the proper officer of the court. Recognisances are *estreated* when they are forfeited by the accused person's neglect to comply with the condition of the recognisance, by failing to appear or otherwise.

Estrelda. [WAXBILL.]

Estremadura, a Portuguese province on the coast, having the province of Beira on the N. and E., Alemtejo on the S., and the Atlantic on the W. The Tagus flows through it, dividing it into almost equal parts, the northern of which has a mountain range reaching a height of over 2,000 feet, and containing the heights of Torres Vedras, and ending near the mouth of the Tagus. This ridge has a flat, sandy district on the west, but a fertile land to the south-east. Wine and olives are produced, and many fruits, and cork is obtained from the forests. Many swine are reared. There are minerals, but they are not worked; and there is some manufacture of woollen and linen. Most of the trade is seated in Lisbon, capital of the province and of the country, and at Setubal.

Eta (Gk. H, η), the seventh letter of the usual Greek alphabet.

Etærio (from the Greek *hĕtairia*, a brotherhood), a term applied to polycarpellary apocarpous fruits, in which the numerous separate carpels may be either dry and indehiscent one-seeded "achenes," as in the buttercups, cinquefoils, strawberry, and rose; dry but dehiscent and many-seeded "follicles," as in columbine, hellebore, and magnolia; or succulent "drupels," or miniature drupes, as in raspberry and blackberry. [FRUIT.]

Etawah, a town of N.W. Hindustan, capital of a district of the same name in the province of Agra, 70 miles S.E. of Agra. The town, on the bank of the Jumna, occupies a number of heights separated by deep ravines. It was once of importance, but is now decaying. The district is watered by the Jumna and the Ganges, and the climate, much modified by recent planting of trees, is good from October to May, but in spring hot winds prevail. Cotton, indigo, sugar cane, and many European fruits are the chief productions. It was once a favourite resort of Thugs, and was an important station of the revolted Sepoys during the Indian Mutiny.

Etching, a method of engraving (q.v.), (from old Dutch, *etsen*, to eat), consists in eating-in a design upon steel, copper, or other substance by means of an acid. The substance to be etched is covered with wax or composition, and the design is scratched through this down to the metal, and acid is then applied which eats into the substance wherever it is not protected by the wax. Albert Dürer is said to have been the first to adopt the method, and it was much employed by Rembrandt and his school.

Ethane, C_2H_6, is the second member of the group of hydrocarbons known as paraffins (q.v.), and occurs naturally in the gases evolved from petroleum wells. It may also be prepared by numerous synthetic and other reactions. It is a colourless gas, which burns with a pale flame, is almost insoluble in water, and but slightly soluble in alcohol. By the action of chlorine, etc., substitution products are obtained in which one or more hydrogen atoms are replaced by the substituting body. In the nomenclature of such compounds the name of the substituent is placed before the ethane, as monochlor-ethane, C_2H_5Cl, chloro-bromethane, $C_2H_4ClB_r$, etc. If only one hydrogen is replaced the resulting compound contains the group C_2H_5 which is known as *ethyl*, so that monochlorethane could be also called ethyl chloride. If two hydrogens are replaced by substitutes, two series of compounds can be obtained, (1) those in which the displaced hydrogens were attached to different carbon atoms, termed *ethylene* compounds as $CH_2Cl.CH_2Cl.$; (2) those in which they were united to the same carbon atom, *ethylidene* compounds as $CH_3.CH.Cl_2$. Such isomeric [ISOMERISM] compounds exist also among the polysubstitution compounds.

Ethelbert (545–615), King of Kent, and Bretwalda, married Bertha the Christian daughter of King Charibert of Paris. This marriage led to a visit of a Christian mission led by St. Augustine. The king and the greater part of his subjects adopted the new religion, and the church founded by the king is said to have been on the site of the present cathedral of Canterbury. The body of laws instituted by Ethelbert was the foundation of the Saxon code.

Etheldreda, ST. (630–679), was a daughter of a king of the East English. She was twice married, the second time to Oswy of Northumbria; but the married state was distasteful to her, and she took refuge from it, first with her aunt Ebba, at St. Abb's Head, and then in the Isle of Ely, where she founded an abbey, now the cathedral. Her feast-day is the 17th of October, and she has the credit of giving the word "tawdry" to the English language.

Ethelred, the name of two Saxon kings of England. ETHELRED I., brother and predecessor of Alfred, spent most of his reign in combating the Danes, and was mortally wounded in fight with them in 871. ETHELRED II. (966–1016)—called "the Unready" on account of his indolence of character—was the son of Edgar and Elfrida, who killed her stepson, Edward, in order to put her son on the throne. He was the first to introduce the payment of Danegelt, and his massacre of Sweyn's sister and other Danes led to the establishment of the Danish dynasty in England; while his marriage with Emma of Normandy, and his taking refuge at the Norman Court, was the indirect cause of the Norman conquest.

Ethene. [ETHYLENE.]

Ether. 1. In *Astronomy* and *Physics*. Between any two members of our solar system the existence of a force of gravitation may be demonstrated, and there seems no good reason for doubting that such gravitational force exists between any two masses in the universe. There must, therefore, be some medium between them to transmit such a stress. In the near neighbourhood of the earth an atmosphere of ordinary material gases exists, but at more remote distances such material is absent, and physicists are compelled to assume the existence of a medium of a special kind. Such a medium is the ether. But inasmuch as no entirely rational theory of gravitation has as yet been proposed, the possible properties of the requisite ether have not been pointed out. Again, light can reach us from the sun or other stars; there must, therefore, be an ether between these heavenly bodies that can transmit waves of light. A little more is known on the subject of light-waves than of gravitation, and various theories on the nature of the luminiferous ether have been propounded. Thus it is plausibly suggested that the ether is an extremely elastic solid, of great rigidity, but small density; that it behaves as a solid for such oscillations as occur in ordinary light-waves, but as a liquid for comparatively slow motions, such as that of the earth or other heavenly bodies passing through it—in fact, that it is a very viscous fluid, behaving like a solid for high speeds of displacement. Further, electro-magnetic displacement may be transmitted through a space void of

ordinary matter; it also demands the existence of an ether. Mathematical and other considerations led Clerk-Maxwell to regard the electro-magnetic and the luminiferous displacements as similar, and as requiring only one ether. This is the basis of his electro-magnetic theory of light. It would simplify matters considerably if one ether could be suggested that possessed the requisite properties to transmit the various gravitational, electro-magnetic, and other effects. But different physicists at present regard the requisite properties differently, and one ether would have to be endowed with most paradoxical properties. The subject is, therefore, still very slightly understood. [MAGNETISM, VORTEX-THEORY.]

2. In *Chemistry* the term ether is, like the terms alcohol, aldehyde, etc., a generic name applied to compounds of the form $R.O.R^1$, where $R.R^1$ represent monovalent hydro-carbon radicals. They hence bear constitutionally the same relation to alcohols R.O.H. that metallic oxides bear to the corresponding hydroxides. If the radicals $R.R^1$ represent similar radicals the ether is called a *simple* ether, if different a *mixed* ether. They can be prepared by a number of general reactions, and by oxidation break up, and are oxidised to organic acids. In their general properties they resemble one another to a great extent. Ordinary *ethyl ether*, $C_4H_{10}O$, known also as *sulphuric ether*, or simply as *ether*, is a colourless mobile liquid, with a pleasant and characteristic odour. It is very inflammable, and as it boils at about 35° C. it gives off an inflammable vapour at comparatively low temperatures. It mixes with alcohol, chloroform, etc., and is slightly soluble in water. It forms a good solvent for fats, resins, and organic compounds generally, and is largely used by the chemist for such purposes. It is prepared by distilling a mixture of alcohol and sulphuric acid at about 140°, the alcohol being allowed to flow continuously into the distilling flask, at a rate such as to keep the temperature fairly constant. The ether which distils over is afterwards treated with quicklime and calcium chloride, and redistilled. (For the equation involved *vide* ETHERIFICATION.) Ether is largely employed in the chemical laboratory for a large variety of purposes, and frequently for the production of low temperatures. It is largely employed medicinally as an anæsthetic.

Etherege, SIR GEORGE (1636–1694), was a dramatist and wit of Charles II.'s reign. He was educated at Cambridge, and entered at an inn of court, after which he travelled in France and Flanders, and then devoted himself to literature, and became known as a writer of comedies. His three known comedies are *The Comical Revenge: or, Love in a Tub* (1664), *She Would if She Could* (1668), and *The Man of Mode* (1676). James II. knighted him, and he was appointed envoy to Ratisbon. He is thought to have accompanied the king to France after the Revolution, and to have died there, but the exact year of his death is unknown. There are some letters, poems, and papers of his in the British Museum, and an edition of his works was published in 1888.

Etherification, the term applied to the formation of ethers, or frequently also of ethereal salts or esters. In a restricted sense it signifies the formation of ordinary ether from alcohol and sulphuric acid. The reactions involved in this may be taken as typical ones, and appear to be as follows:—

(1) The formation of ethyl-sulphuric acid from the alcohol and acid.

$$C_2H_6O + H_2SO_4 = C_2H_5.HSO_4 + OH_2.$$

(2) Further reaction of the ethyl sulphuric acid with alcohol, ether being formed and sulphuric acid regenerated.

$$C_2H_5.HSO_4 + C_2H_6O = (C_2H_5)_2O + H_2SO_4.$$

The formation of ethereal salts appears to be analogous. For this the alcohol and organic acid react upon one another in the presence of a strong acid, the reactions being represented by—

(1) $C_2H_6O + H_2SO_4 = C_2H_5.HSO_4 + OH_2.$

(2) $C_2H_5.HSO_4 + C_2H_4O_2 = C_2H_5.C_2H_3O_2 + H_2SO_4$

in the case of the preparation of ethyl acetate.

Ethine. [ACETYLENE.]

Ethiopia (etymologically, the land of "burnt faces"), called in Hebrew *Cush*, was a name used with differing signification in ancient times. It was sometimes applied to the regions of both Africa and Asia; at others, to the country south of Egypt and Libya from the Red Sea to the Ocean; and again to modern Nubia and Abyssinia—its capital being Meroe. There appear to have been many peoples and divisions. The language—called Geez—seems to have been a Semitic tongue, akin to Arabic, but having peculiarities of its own. This is no longer a spoken language, but exists in literature and in the Church, there being translations of the Bible and of certain uncanonical books. Christianity is supposed to have been introduced in the 4th century, and Dr. Wolff, the missionary, had some curious theories as to a Jewish element in Abyssinian Christianity dating from the time of King David. The country is spoken of in the Bible in connection with Egypt, and at times exerted a powerful influence upon Jewish history. Candace, Queen of Ethiopia, is mentioned in the New Testament. Some have thought that Egypt derived its civilisation in a great measure from Ethiopia: but modern researches go to prove that the tide of civilisation set the other way.

Ethiopian, a term of uncertain origin and varied application in ethnological treatises. For the Greeks all the peoples of Africa beyond Egypt were Ethiopians; but there were also Asiatic Ethiopians, and the term Ethiopia was, in fact, given to every region whose inhabitants were of a black colour, burnt, as was supposed, by the heat of the sun. the popular derivation being from *aithō*, to burn, and *ōps*, face. Later, the Abyssinians, although Semites, adopted the word, and now call themselves "Ithiopiavian"; but under this designation modern ethnologists comprise the eastern branch of the Hamitic family, whose chief members are the Bejas, Gallas, Somali, Danâkil, and Agau. [HAMITIC RACES.]

Ethiops Mineral, the name applied to a black compound obtained by heating sulphur and mercury in the proportion of about 1 to 6 parts, and from which by redistillation and treatment with water *vermilion* was obtained.

Ethmoid Bone (from a Greek word meaning a sieve) is a bone lying in the anterior portion of the base of the skull.

Ethnology (Gk. *ethnos*, a race, a people; *logos*, a discourse), properly that branch of anthropology which treats of the various fundamental divisions, subdivisions, and varieties of mankind. It is thus essentially different from *ethnography*, which is purely descriptive, dealing with the characteristics, usages, social and political condition of peoples irrespective of their mutual physical relations or affinities. The subjects of ethnography are the various groups of peoples taken independently one of the other; the subjects of ethnology are the same human groups regarded as so many co-related members of one or more primordial families. Hence, ethnology necessarily proceeds by the comparative method, co-ordinating its facts with a view to determining such questions as the antiquity of man; monogenism and polygenism; the geographical centre or centres of the evolution and dispersion of mankind; number and essential characteristics of human types; absolute and relative value of racial criteria (colour and texture of hair, complexion, shape of skull, facial angle, facial bones, shape of eyes, nose, mouth, proportionate length of extremities, mental qualities, and the like); miscegenation; origin and evolution of human speech, and its value as a test of race; stock races and languages; mixed races and languages; influence of the environment on the evolution of human varieties, on their pursuits, temperament, religious views, social status; origin of the human family, of the tribe and nation. These questions cannot here be discussed in detail; but it may be stated in a general way that the monogenist view, which derives mankind from a single pair, is now generally accepted by sound ethnologists, both as inherently more probable than the polygenist doctrine of several independent centres of evolution, and also as sufficient to account for the actual conditions. Monogenism, which has such an important bearing on the whole study of man, is based, not on scriptural authority, but on the solid ground that all existing divisions of mankind are fruitful among themselves, and otherwise present such close physical and mental qualities as are best explained by their descent from a common ancestry. Viewed in this light the subjects of discussion assume a totally different aspect; there are no longer any absolutely fundamental divisions of mankind; all are connected by their common genetic descent, and such terms as race, type, stock, acquire a purely relative sense. The *genus homo* is replaced by the *species humana*, which branches off into an indefinite number of *varieties*, but which nevertheless presents a few marked types, which it is still convenient for purposes of classification to distinguish and to regard as practically fundamental. Blumenbach (1752–1840), who may be regarded as the founder of systematic ethnology, recognised five such fundamental types: Caucasic, Mongolic, Ethiopic (Negro), American, and Malay, including in the last the Polynesian and Australian. Since then various other schemes of classification have been proposed with a general tendency to diminish the main divisions, which by the best living anthropologists are now reduced to three: *Ethiopic* or *Negro*, chiefly in Central and South Africa, Oceania, the West Indies, and the Southern United States, numbering altogether about 230,000,000; *Mongolic* or *Yellow*, including Blumenbach's Malay and American, chiefly in North, Central and South-East Asia, the Eastern Archipelago, Polynesia, and America, numbering 650,000,000; *Caucasic* or *White*, nearly all Europe, South and South-West Asia, North Africa, North America, the southern extremity of Africa, and Australasia, numbering over 700,000,000. (For the physical and mental characteristics of these fundamental groups and other details, *see* CAUCASIC, MONGOLIC, and NEGRO RACES.) Here the chief point to attend to is the vast antiquity of man, dating certainly from quaternary times, which, combined with his migratory and predatory habits, has resulted in endless interminglings and a consequent partial obliteration of the primordial types. Hence there are scarcely any, if any, absolutely pure or unmixed races; the ideals have long disappeared, and the scientific ethnologist recognises, not so much any sharply defined Negro, Mongolic, or Caucasic divisions, as certain Negroid, Mongoloid, or Caucasoid groups, between which it is seldom possible to draw any hard-and-fast lines. As the process of miscegenation is still going on, the tendency is to still greater effacement of racial distinctions, and, in fact, to a reversion to the primordial unity or, at least, to a substantial uniformity of type, affected partly by interminglings, partly by the elimination of the lower elements incapable of assimilation. But the environment has to be reckoned with; and while miscegenation tends to uniformity, climate, soil, relief of the land, food, pursuits, and other outward influences will "redress the balance" and have the effect of maintaining and even intensifying the physical and mental differences now existing between the various divisions of mankind.

Ethyl. [ETHANE.]

Ethylamine, $C_2H_5NH_2$, is a colourless inflammable liquid which may be regarded as ammonia (NH_3), in which one atom of hydrogen has been replaced by the radical *Ethyl* (C_2H_5). It is present in the distillation product of beet-sugar molasses, and may be artificially prepared by very many methods, *e.g.* by heating ammonia and ethyl chloride,

$$2NH_3 + C_2H_5Cl = NH_2.C_2H_5 + NH_4Cl.$$

It is very soluble in water, and the solution is very strongly alkaline. It has a strong odour like that of ammonia, which it closely resembles in all its properties, but behaves as a stronger base. By replacement of the remaining hydrogens of the ammonia by ethyl, *diethylamine* $(C_2H_5)_2NH$ and *triethylamine* $(C_2H_5)_3N$ may be obtained.

Ethylene, C_2H_4, is the first of the series of hydrocarbons known as the *olefines* (q.v.), all of

which can be represented by the general formula C_nH_{2n}. It is a colourless gas slightly soluble in water and alcohol. It is inflammable, burning with a luminous flame. It is formed by destructive distillation of wood and most organic bodies, and is hence found in coal-gas, of which it is the principal illuminating constituent. In may be most readily prepared by distilling a mixture of alcohol and concentrated sulphuric acid. It can be liquefied by great cold and pressure, and by its rapid evaporation very low temperatures can be obtained. Large quantities of liquid ethylene were thus used in the preparation of liquid oxygen. It readily forms addition products, and is hence said to be *unsaturated*. With chlorine it forms an oily liquid (Ethylene Chloride, $C_2H_4Cl_2$) known as Dutch liquid, owing to which it received formerly the name olefiant gas.

Etiolation (from the French *etioler*, to blanch), the bleaching of leaves by the imperfect development of chlorophyll, either from the exclusion of light, the absence of iron or other mal-nutrition. It is often accompanied by the non-development of poisonous principles, as in the artificial blanching of celery.

Etive, Loch, in the Lorne district of the county of Argyle, Scotland, is an inlet of the sea upon the west coast, of varying breadth, but nowhere more than $1\frac{1}{2}$ miles wide, and extending for 20 miles inland. It has beautiful scenery, and there are several creeks which afford good anchorage to vessels. Not far from the entrance is a rapid caused by a ridge of rocks, and at certain states of tide this is a cataract.

Etna (now locally called Monte Gibello) is a lofty volcanic mountain of Sicily, in the province of Catania, on the east coast. Although it has the appearance of being isolated, it is in reality connected by a ridge with the general mountain system which runs from east to west along the northern coast of the mountain, and is a continuation of the Italian chain. The ancients fabled it as the prison of Enceladus and Python, and also as the workshop of Vulcan and the Cyclopes, whose labours and restlessness gave rise to the volcanic manifestations and earthquakes. The first recorded eruption took place in the time of Pythagoras, since when there have been very many at varying intervals, and the volcano was in eruption in July, 1892, to the great dread of the province, which has often suffered severely from both eruptions and earthquakes. The crater at the top has often changed its place. The mount, from the point of view of climate, may be divided into three belts, the lowest of which is very fertile. The middle belt used to be covered with fine forests of beech, chestnut, oak, and pine; and the highest region is almost desert, and is covered for great part of the year with snow. The summit is at a height of 10,960 feet.

Eton, a town in the county of Buckingham, on the left bank of the Thames, which separates it from Windsor, the two towns being united by an iron bridge. Eton College, one of the chief public schools of England, was founded by Henry VI. in 1440, and dedicated to the Blessed Virgin. Besides the college, which has a Provost and fellows and seventy scholars, there is a varying number—generally about 900—of Oppidans ("town-boys"), as the pupils not on the foundation are called. The scholars are lodged in college, but the Oppidans are distributed among boarding houses kept by masters, "dames," or others, in various parts of the town. Candidates for scholarships must be between 12 and 15 years of age, while Oppidans are admitted between the ages of 10 and 14. There are scholarships and exhibitions to Oxford and Cambridge. The college, parts of which date from the years immediately following the foundation, is chiefly Perpendicular, but additions are constantly being made according to the requirements of modern education. The older buildings consist of two quadrangles, containing chapel, upper and lower schools, masters' rooms, provost's lodge, fellows' apartments, and library. Till comparatively recent times the curriculum was entirely classical, but now the ordinary subjects of a liberal education are also admitted. The playing fields of Eton are famous, and its cricketers often win renown afterwards at Oxford or Cambridge and elsewhere, while the facilities for boating on the Thames make the Etonian oarsmen valuable recruits for College and University eights. There is also a numerous cadet corps, which forms a battalion of itself. The old custom of *Eton Montem* has been abolished. [Montem.]

Etruria, the ancient name of the country in Italy lying to the W. of the Apennines and the Tiber. This was Etruria proper, though at a certain period of prosperity the Etruscans held the valley of the Po and part of the region south of the Tiber. Central Etruria consisted of a confederation of twelve cities, and one of these cities, whose remains show that it must have contained a vast population and have reached a high state of civilisation, was for centuries the great rival and deadly foe of Rome. The early history of Rome is mixed up with that of Etruria: the Tarquins were an Etruscan family who gained the upper hand in Rome, and were driven from it by a revolt, and Lars Porsena of Clusium was perhaps no more a single personage than Pharaoh of Egypt, since the name seems to have designated an office. Throughout the country vast cemeteries, the remains of Cyclopean walls, countless inscriptions in archaic language, and often indecipherable, richly decorated tombs, and mural paintings, bear witness to a civilisation compared with which that of Rome was infantine. The Etruscan civilisation was centuries earlier than that of Rome, and when history, as distinct from legend, begins, Etruria was a great naval power fit to ally itself with Carthage, and Rome was to a great extent an Etruscan city, deriving much of its religion, social customs, and greatness from that source. Hiero of Syracuse fought with and defeated an Etruscan fleet off Cumæ in 525 B.C. The death-blow to Etruria as a separate power seems to have been given by the irruption of the Gauls

under Brennus, and from that time they gradually yielded to the supremacy of Rome.

Etruscans, one of the cultured nations of antiquity, who were the dominant people of Italy before their overthrow by the Romans (280 B.C.). Their chief seat was the valley of the Arno, and thence south to the Tiber ; but they had also reached the Adriatic slope, where they held the cities of Adria, Ravenna, Felsina (Bologna), and Mantua. On the west side, where their southernmost stronghold was the island of Capri, they had established a confederacy of twelve towns in Campania, while their navies or piratical fleets swept the Tyrrhenian Sea, named from them. The Etruscans, who called themselves Rasena, were known to the Greeks as Tyrrheni (Tyrseni) from a mythical leader, under whom they were fabled to have reached Italy from Lydia (Asia Minor), though more trustworthy tradition brought them over the Alps through Rhœtia down to the valley of the Po. But the

ETRUSCAN VASES.

origin of the Etrusci or Tusci, as the Romans called them, is still wrapped in deep obscurity, and has given rise to endless discussion amongst ethnologists and philologists, some regarding them as Italic or Celtic Aryans, others affiliating them to the Semites or to the "Turanian" (Mongolo-Tatar) stock, while Brinton has recently, on shadowy grounds, proposed a Libyan (Berber) connection. Unfortunately their language, which survives only in numerous short sepulchral and other inscriptions and in one long document lately found enveloping an Egyptian mummy, has failed to solve this difficult question, the structure and affinities of the language itself being even more angrily discussed than the origin of the people. Sir W. Betham freely interpreted the Etruscan texts through the medium of the Irish (Celtic), of which he had little knowledge ; Corssen explains them by means of the Italic. regarding Etruscan as fundamentally connected with Latin, Umbrian, Oscan, and the other members of that family ; lastly, Robert Brown and many others have, with some show of success, expounded these inscriptions by the aid of the Finno-Tataric group, of which they consider Etruscan to be undoubtedly a distinct branch. Yet the Etruscan physical type, as preserved on the cinerary vases and even still surviving amongst some of the modern Tuscan peasantry, is neither Italic, nor Celtic, nor yet Mongolic, as postulated by these theories based on doubtful linguistic evidence. The Etruscans, who under Hellenic influence developed a characteristic school of art, appear to have been a short, thick-set race, inclined to obesity, with broad shoulders, arched nose, broad receding forehead, kinky hair, dark or swarthy complexion, and dolichocephalic (long) head. Their artistic sense seems to have permeated all classes, and may still be studied in their numerous sepulchral monuments, painted vaults, bas-reliefs, bronzes, candelabra, fictile vases and pottery of all kinds, gems, fibulæ, bracelets, and other ornaments. From the Etruscans the Romans received their first lessons both in art and in such religious practices as divination and sacrificial offerings. The *Cloaca Maxima*, the oldest extant monument in Rome, was built by them, as were also the Mamertine Prison and the walls attributed to Servius Tullius. Even the bronze wolf preserved in the museum on the Capitoline Hill, and associated with the earliest Roman legends, is said to be the work of an Etruscan artificer ; but the Etruscans nowhere succeeded in developing a great military power—their scattered colonies forming so many independent kingships or republics unconnected by any strong political ties. The Gauls had little difficulty in overrunning Etruria in 590 B.C., and three centuries later it fell an easy prey to the conquering Romans, who rapidly destroyed Etruscan culture and the national records, though the Etruscan language still survived in some rural districts down to the time of Augustus and Claudius. It was written usually from right to left in a great variety of characters, all, however, based on the archaic Cadmean alphabet introduced at a remote epoch by the Greeks into Italy. A literature in the ordinary sense of the term seems to have never been developed, and to this, combined with the iconoclastic spirit of the Roman conquerors, is mainly due the sudden extinction of Etruscan civilisation. (Lanzi, *Saggio della Lingua Etrusca*, Rome, 1789 ; Corssen, *Ueber die Sprache der Etrusker*, Leipzig, 1874 ; Conestabile, *Iscrizioni Etrusche*, etc., Florence, 1858 ; Robert Brown, jun., *Etruscan Studies*, in the *Academy*, 1886–92, *passim*.)

Etty, WILLIAM (1787–1849), an English painter, born at York, where also he died. For seven years he was apprenticed to a printer at Hull, but in 1807 he came to London, entered the Royal Academy as a student, and studied under Sir Thomas Lawrence. His early efforts were refused at the exhibitions, his colouring being considered good, but his designs feeble, and it was not till after a visit to Italy that he achieved some success with his *Pandora* and his *Coral Finders* in 1820, which was followed up the next year by his *Cleopatra Arriving in Cilicia*. His *Pandora Crowned by the Seasons* caused him to be elected A.R.A. in 1824. From this time his progress was constant,

and he became renowned as a colourist, and for his representation of the nude. Of his many works, *Ulysses and the Syrens*, *Youth at the Prow and Pleasure at the Helm*, and *Woman Pleading for the Vanquished*, are well known.

Etymology (Gk. *etumos*, true), a term used in philology to imply the true original sense of a word, or "the tracing out and describing the elements of a word with the modifications of form and sense." In a secondary sense it denotes the branch of philology which is connected with this. The discovery of Grimm's Law and a rigid scientific method of research have made a revolution in the science of etymology, which till comparatively late years was wildly fanciful. In grammar, etymology is that part which deals with letters and the parts of speech separately.

Eubœa (modern *Negropont;* Turkish *Egripo*), an island of the Ægean Sea, opposite to Bœotia, Thessaly, and Attica, being separated from the mainland by the Euripus, the channel of which is at Chalcis or Negropont (the capital) only 120 feet across, and is crossed by a bridge partly supported by a rock in the middle of the channel. (It is now being widened by the Greek Government.) There is much trace of volcanic action and the formation is principally slate or calcareous. There are two mountain chains, one of which in the north extends to Cape Sunium; and the highest point is Delphi in the centre (5,725 feet). The island is wonderfully fertile and salubrious, and there are extensive woods of pines, firs, chestnuts, and planes on the mountain sides. Much of the cultivation is carried on by English and French farmers.

Eucalyptus, a large genus of trees belonging to the myrtle family, natives of Australia or Tasmania, a few species occurring as far north as Timor and the Moluccas. Many of them grow to an immense size, and, though rapid in growth, yield dense and valuable timber. *E. amygdalina*, the peppermint-tree, reaches 480 feet in height, or 150 feet more than the tallest Sequoia (q.v.), and 100 feet in girth; and other species approach these dimensions. Some are known as *Iron-barks*, others as *Stringy-barks*, whilst from their resinous exudations the whole genus are known as *Gum-trees*. The leaves are entire; leathery; studded with glands containing fragrant volatile oils; at first opposite and horizontal, afterwards scattered and vertical; and so varying in form at different ages as to have led to considerable confusion in the discrimination of species. The flowers are axillary, and either solitary or in clusters. The superior calyx is woody, and its upper half falls off as a cap as the flower opens, carrying the corolla with it. The stamens and the seeds are indefinite in number. As timber, *E. globulus*, the blue gum; *E. gigantea*, the stringy-bark; *E. amygdalina*, the peppermint-tree; *E. resinifera*, the iron-wood; and the tewart and jarrah, *E. goniocalyx* and *E. marginata* of West Australia, seem the most valuable. *E. rostrata*, *corymbosa*, and *citriodora*, with other species, yield the useful astringent Australian kino (q.v.); *E. Gunni*, the cider-tree of Tasmania, gives a refreshing sap in spring; and *E. mannifera*, *E. viminalis*, and others, exude a saccharine manna (q.v.). Volatile oils have been distilled from the leaves of many species. That known as eucalyptus oil, used in soap-making and as an adulterant of attar of roses and oil of neroli, is now largely manufactured in Australia, mainly from *E. amygdalina* and *E. citriodora*. It is thin, pale yellow, and pungent, resembling oil of lemon. *E. hæmastoma*, of Queensland, yields an oil intermediate between those of geranium and peppermint, and *E. Staigeriana* 2 to 3 per cent. of one closely similar to oil of verbena. Mallee oil, that of *E. oleosa*, is a useful solvent for copal, resembling cajeput. Eucalyptus leaves are smoked to relieve asthma and bronchitis; and the warm aromatic tincture prepared from them, which resembles cubebs (q.v.) in its bitter taste, though inferior to quinine in fever, is a powerful diaphoretic increasing the heart's action. Since 1854 the blue gum, *E. globulus*, so called from its glaucous leaves and young stems, has been successfully introduced into the Roman Campagna and elsewhere in Southern Europe—into Algeria, Egypt, Natal, India, California, and other countries with miasmatic swamps, scant supplies of firewood, or climates liable to drought. Its action on miasma is probably merely the drainage effected by its roots. It seems to thrive anywhere where the mean annual temperature is not less than 60° F., but cannot survive a temperature below 27° F.

Eucalyptus Oil, the essential oil obtained from *Eucalyptus globulus*. It is a pale yellow liquid, with a peculiar odour. It has a specific gravity ·93, and gives many products by distillation. It appears to consist of a substance *eucalyptol*, $C_{10}H_{18}O$, together with hydrocarbons allied to the terpenes.

Euchlorine, a yellow gas which is evolved when potassium chlorate is acted upon by hydrochloric acid. Faraday believed it to be a definite oxide of chlorine, but it has been shown that it really consists of a varying mixture of chlorine and chlorine peroxide ($Cl\,O_2$). It has powerful oxidising properties, and is much used for disinfecting, etc.

Euchre (possibly from a Spanish word) is the name of a game of cards played chiefly in America. It is played by two, three, or four people, and the pack consists of 32 cards, those from 2 to 6 inclusive being thrown out. The chief cards are the Right Bower (Germ. *bauer*, peasant), which is the knave of trumps, and the Left Bower, which is the other knave of the same colour, the remaining cards being valued as in whist. A player has the option of playing or passing; if he plays and gets a minority of the tricks (which are five in number), he is euchred, and his opponent scores 2. Generally the gainer of 5 tricks scores 2, of 3 tricks 1. The cards must be dealt 3 and 2. There are modifications of the game, such as French Euchre, in which there are 24 cards, and Railroad Euchre, where there is an extra card.

Euclid. 1. Of Megara, one of the founders of the Megarian school of philosophy (about 400 B.C.). His doctrines probably influenced those of Plato.

2. A famous geometrician who lived and taught in Alexandria at about 300 B.C., in the time of Ptolemy I. Besides his *Elements* he wrote the *Phenomena*, on astronomy, and the *Data*, a collection of geometrical theorems, and possibly also various books on Harmony, Optics, etc. Euclid's *Elements* have been used as a text-book for centuries, though abroad various systems of modern geometry have taken its place. It is in thirteen books ; the first four are on plane geometry involving only figures built up of straight lines and circles ; the fifth is on proportion generally ; the sixth on proportion as applied to similar plane figures ; the seventh, eighth, and ninth are on numbers ; the tenth on incommensurable quantities ; and the last three on solid geometry. The first printed edition of the *Elements* was published at Venice in 1482. The only full edition is that of Gregory, published at Oxford in 1703.

Eudiometer, a glass vessel, largely used in gas analysis. Various forms of eudiometers exist, many specially adapted for some particular analysis. The most common form consists of a straight tube of thick glass open below and closed above, upon which is accurately engraved a scale, generally in millimetres. Through the glass near the top are sealed two platinum wires across which an electric spark can be passed. The mode of use consists in placing a known quantity of gas into the eudiometer over mercury, then adding an amount of oxygen (other gas if necessary) and exploding. From the diminution in volume (and further diminution by action of different absorbents if necessary) the quantity of hydrogen or other detonating gas is known.

Eudoxia, an empress of the 5th century, wife of Arcadius, and mother of Theodosius II. She was the beautiful daughter of a Frank general at Byzantium, and a courtier named Eutropius caused her to be selected by Arcadius by leaving her portrait, as if accidentally, in the Emperor's way. Eutropius afterwards presumed upon his power to threaten her if she thwarted his views, and she in consequence brought about his ruin. She was also a great enemy of St. John Chrysostom, who used to compare her with Jezebel and Herodias, and in the struggle between his partisans and hers St. Sophia was burnt and half Constantinople. She was in many respects not unlike Theodora. Her death took place in 404.

Euechinoidea, the name of the sub-class of Echinoidea (q.v.) including all the Echinoids which have lived in and since Jurassic times, with some few representatives in earlier seas. The sub-class, though accepted for convenience, cannot be distinguished from the earlier "Palæechinoidea" by any satisfactory definition.

Eugène Francois, commonly known as Prince Eugène (1663–1736), a celebrated Austrian general and statesman, was born at Paris, his father being Eugène, Duke of Savoy, and his mother a niece of Cardinal Mazarin. He was intended for the Church, but his inclination was towards arms, and he applied in vain to Louis XIV. for his commission, his application being opposed by Louvois, who hated the family. He then entered the Austrian army, and for his good service against the Turks was made colonel. His conduct at the siege of Belgrade (1688) and at Mayence (1689) gained him still further promotion. When war broke out between France and Austria he was sent into Piedmont, and gained the rank of field-marshal ; and at the end of the war went to Hungary as commander-in-chief against the Turks, whom he forced into the treaty of Carlowitz (1699). In the Spanish War of Succession he was commander-in-chief in Italy, and defeated Villeroi at Cremona in 1702. He then commanded the army in Germany, and as head of the Council of War co-operated with Marlborough in gaining the battle of Blenheim in 1704. In 1705 he was again commanding in Italy, and after losing a battle in which he was wounded, he drove the French out of that country. Entering France, he laid siege unsuccessfully to Toulon, and in 1708 and 1709 was engaged with Marlborough in the victories of Oudenarde and Malplaquet. The recall of Marlborough prevented his doing anything more decisive, and after the end of the war he was employed against the Turks, and took Belgrade in 1717 after gaining three victories. He then for 15 years of peace distinguished himself as a statesman, till fresh wars brought him into the field as head of the army of the Rhine, but he did nothing of importance, perhaps in consequence of his advanced age.

Eugeniacrinidæ, a family of Crinoids, characteristic of the Jurassic rocks of the Continent ; they were small forms fixed by a short stem, and with the basal ring of plates quite rudimentary.

Eugénie, Marie de Montijo de Guzman, was born in Andalusia in 1826. Her father was a Napoleonist, and her mother was of an old Scottish family. She lived in different capitals of Europe, and at Paris her horsemanship and her constant attendance at Court fêtes attracted the attention of Napoleon III., who married her in 1853. In the early part of the Empire she was popular for her kindness and her benevolence, and had great influence in State Councils. After the downfall of the Empire she escaped to England, thus avoiding the risk of meeting the same fate as Marie Antoinette, which she is said to have feared. The death of her husband, and the tragic fate of her only son in Zululand, and her friendship with Queen Victoria, have caused Englishmen to look upon her as almost a fellow-countrywoman.

Eugenius, the name of four popes—*i.e.* Eugenius I. (654–657) ; II. (824–827) ; III. (1145–1153) ; IV. (1431–1447).

Eugenius, St., Bishop of Carthage in the latter part of the 5th century. He was twice banished owing to his antagonism to the Arian Vandals, on the second occasion founding a monastery at Vienne, in France, where he died (505). There is a profession of faith which bears his name. His feast is on the 13th July.

Euglena, a small Infusorian, with a short and usually green body ; it has a long, vibratile filament

or flagellum, at the base of which is an eye spot. The members of this genus swarm in stagnant pools of fresh water in such abundance as to discolour it.

Euhemerism (from EUHEMERUS, a Sicilian and Cyrenaic philosopher of the 4th century B.C.), a system of explaining the ancient myths of the Greek gods by looking at them all as deified heroes, whose real deeds viewed through the mist of time became distorted and exaggerated. Euhemerus himself had a vivid imagination, and was looked on as a great liar. The tracing of the religious sentiment to totemism and ancestor worship is a kind of Euhemerism.

Eulenspiegel, or ULENSPIEGEL, TYLL, a well-known character in German, Netherland, and Flemish folk-lore, who is supposed to have existed in the 13th century, is claimed as a native of Germany, and is variously reported to have been buried at Mölln in Germany and at Damme in Flanders. The life of him sets forth his many Puck-like tricks, but his adventures, though amusing, are somewhat too coarse for modern taste. His history existed known in Hoch-Deutsch and in Platt-Deutsch, in the early part of the 16th century, and his doings have been translated into many languages. His name, literally translated, appears in English as (H)owleglas, under which title he is the subject of a miracle-play. There is a modern English edition.

Euler, LEONARD (1707–1783), a distinguished mathematician, who was born at Basel, and educated, first by his father, who was a clergyman, and then at the university under John Bernouilli. When 19 he was *proxime accessit* in a treatise on masting of vessels, invited by the Paris Academy of Sciences. Through his friends the Bernouillis he was called on to constitute the mathematical department in the St. Petersburg Academy, founded by Catherine I., and many hundred papers and dissertations are the proofs of his industry while there. For about twenty-five years from 1741 he was professor of mathematics at Berlin University, but the last sixteen years of his life were passed at St. Petersburg. He was a great advancer of the analytic method, which he applied also to mechanics, and he had a great share in the invention of achromatic telescopes. He also attempted to construct a theory of the tides, and wrote upon metaphysical and philosophical subjects. Among his many works are treatises on the Integral and the Differential Calculus, and an introduction to Algebra.

Eumenides, also called ERINYES, the name given to the Three Furies—Alecto, Megæra, and Tisiphone. The name of Eumenides, or "Well-wishers," was given to avoid offending them, in the same way that the Fairies are called the Good People; while that of Erinyes has no Greek signification, but is said to be traceable from Sanskrit. They were the avengers of blood, and as such are commemorated by Æschylus in the *Eumenides*. Probably the conflict there depicted between them and Apollo indicates the introduction into Athens of a new worship displacing the matriarchate by male kingship.

Eunomius, an ecclesiastic of the 4th century, was born at Dacora, in Cappadocia. He went to Alexandria, and became the pupil of Ætius, and was Bishop of Cyzicus in 360. His Arian views soon led to his resignation, and he was sent to Cappadocia. His views, which were adopted by a sect called after him, were condemned by two Œcumenical Councils. Two apologies and a confession of his are extant.

Eunuch (Gk. *eunē*, a bed, and *ĕchēin*, to hold) is literally a guard or groom of the chamber, but the name is generally applied to the castrated attendants in an Eastern harem. The custom of employing such attendants is of great antiquity. Singers have sometimes been made eunuchs in order to retain their soprano voices, but this barbarous custom is now a thing of the past with regard to the stage.

Euomphalus, an important extinct genus of Gastropoda which ranged from the Lower Silurian to the Trias, and occurred in Europe, America, and Australia. The typical species, *E. pentagonalis*, is a characteristic fossil of the Carboniferous Limestone.

Euonymus, a genus of shrubs and small trees belonging to the order *Celastraceæ*. *E. europæus*, the only British species, has tough, yellowish wood, formerly used for skewers, shoe-pegs, and spindles, whence the plant is known as Spindle-tree. It has glossy leaves and greenish flowers, which are succeeded by bright rose-pink capsules, which on bursting disclose the seeds, each covered with an orange aril. Tennyson therefore speaks of it as "the fruit which in our winter woodland looks a flower." Leaves, flowers, and fruit are poisonous. A good crayon charcoal is made from the wood. *E. japonicus*, an evergreen shrub, with dark ovate leaves, is much cultivated in London, but thrives specially on our south coast. *E. sieboldianus*, the Pai'cha of China, is a substitute for boxwood introduced in 1878.

Eupatoria, a Russian port on the Black Sea, 40 miles N.W. of Simferopol, and in the government of Taurida. It was formerly a town of the Crim Tartars. At the beginning of the Crimean War the allied forces landed here, and the Russians failed in an attack upon it in February, 1855.

Euphemism (Gk. *eu*, well; *phēmi*, I speak) —to speak well of, to speak fair—that figure of speech in which something is called by a fair name instead of a disagreeable or uncomplimentary one. The Greeks called the stormy Black Sea the Euxine ("kind to strangers"), the Furies the Eumenides ("well-wishers"); so the Scots will call the fairies the Good People.

Euphorbiaceæ, the fourth largest natural order of Dicotyledonous plants, comprising over 3,000 species in over 200 genera. Having diclinous

flowers which are usually monochlamydeous, the order is classed among the Incompletæ. Though half its species belong to tropical America, the genus *Euphorbia* contains 700 species, many belonging to Africa, and others scattered over nearly the whole world. They vary immensely in size and habit from large trees to tiny herbs; but almost all agree in having a milky, acrid, poisonous juice. Their leaves are generally scattered, simple and stipulate, and their flowers typically pentamerous. The stamens may be indefinite in number and free, monadelphous or polyadelphous. The ovary is superior, and generally composed of three carpels, which separate more or less elastically from a central carpophore, and contain one or two seeds, which are pendulous, albuminous, and often arillate. The genus *Euphorbia* is singularly varied in habit, some African species being 30 to 40 feet high and 2 feet in diameter, and others succulent and angular, with their leaves reduced to spines so as to closely resemble the Cactaceæ (q.v.), whilst our British species are mostly mere weeds with foliage often of a vivid green. All agree, however, in the character of their inflorescence. This is surrounded by a cup-like involucre or "cyathium," with four or five marginal lobes alternating with glandular structures. Within this cup are several male flowers and one female one in the centre. The former each consist of a single stamen, the junction of its filament with its pedicel suggesting an articulated filament. The female flower is also pedicellate, hanging over the edge of the cyathium, and none of the flowers have any perianth. *Euphorbia resinifera*, a native of the Barbary States, yields on incision the acrid resin known as *Gum Euphorbium*, formerly used medicinally; *E. Cattimandoo*, of Madras, yields the caoutchouc *Cattimandoo;* and *E. Drummondii*, the alkaloid *Drumine*, which has anæsthetic properties like those of cocaine. The poisonous properties of most members of the order are more or less dissipated by heat, so that many are used as food. Of these the most important is the Manioc (*Manihot*), the source of cassava (q.v.) and tapioca. Other valuable plants belonging to this order are the various species of *Hevea* yielding the caoutchouc of Brazil; *Ricinus communis* yielding castor oil (q.v.); *Croton Tiglium*, from which croton oil (q.v.), and *C. Eleuteria*, from which Cascarilla bark (q.v.) is obtained. From *Aleurites triloba*, candle-nut, country walnut, or kekune oil is obtained in the Fiji and Sandwich Islands, and *Stillingia sebifera* is the Chinese tallow-tree. *Crozophora tinctoria*, the "turnsole" of the Mediterranean region, and *Mallotus philippinensis*, "kamala" or "wars," yield dyes; *Hura crepitans* has a large woody fruit, which, though singularly explosive, can be prepared as a sand-box, whence the tree takes its name; and the box-wood (q.v.), *Buxus sempervirens* is so closely related to the order as generally to be classified with it.

Euphrates, a river of Western Asia, which, with the Tigris, encloses the fertile region known in Scriptural history as Mesopotamia, the river formed by the junction of the Euphrates and Tigris falling into the Persian Gulf, 60 miles below Basra, after a course of 1,700 miles, 1,200 of which are navigable for light vessels, and 120 for war vessels. Babylon and Nineveh were both in the Euphrates region, which was kept fertile by an elaborate system of irrigation. Attention has of late years been drawn to the valley as a likely route to India, either by improving the navigation, or by construction of a railway, or by a union of the two plans, but political considerations have prevented any practical result.

Euphuism, literally the imitating of Euphues. This was the part title of a book, or rather books, written by Lyly in the latter part of the 16th century. The language was high-flown, and the sentiments exaggerated and fantastic, but the books became the models of court speech. Scott, in the *Monastery*, tries to show us what it may have been like in the mouth of a courtier, as does also Kingsley in *Westward Ho.*

Euplectella, a genus of Siliceous sponges, including the Venus's flower-basket (q.v.).

Eupsammidæ, a family of Perforate corals including the majority of that group. Some genera, such as *Stephanophyllia*, have affinities with the *Fungidæ* (q.v.). The family first becomes important in the Cretaceous, but one genus (*Calostylis*) from the Silurian has been assigned to it.

Eurasians (*i.e.* "European Asians") a term commonly applied to the half-caste Europeans and natives of India and other parts of Asia. The most numerous and the most degraded are the Portuguese half-castes of Goa, Diu, Ceylon, the Malay Peninsula, Timor, and Macao, who are often scarcely distinguishable from the surrounding populations. In Malacca they are known as *Sirani—i.e.* "Christiani"—and all are still nominally Roman Catholics. The British Eurasians of India are generally superior in physique, energy, and intelligence to the Hindus, but have the reputation of being crafty, if not dishonest, and are treated almost as outcasts both by Europeans and natives. In recent years a fine race of Eurasians has sprung up in Indo-China by crossings between the French and Annamese. They are numerous, especially in Lower Cochin China, where many possess the best physical and moral qualities of both races.

Eure, a department and also a river of France. The river, which gives its name to two departments, rises in the department of the Orne, flows through the departments called after it, and falls into the Seine near Pont de l'Arche. For half its course of 124 miles it is navigable. The department is to the E. of Calvados, and has an area of 2,300 square miles. It consists, for the most part, of a succession of flat plains watered by many streams, which all eventually flow into the Seine estuary, which forms a portion of the N.W. boundary of the department. The climate is humid, variable, and temperate, and well fitted for the growth of plums, cherries, and pears. The vine is plentiful, but little wine is made. Hemp and flax are grown, and the district is noted for cattle- and horse-rearing. Game and fish also abound. The mineral productions are important, and the copper, iron, and zinc works

employ 50,000 people. There are also quarries, and fuller's earth and potter's clay are produced. The manufactures are varied and extensive, one of the productions being a fine woollen cloth. The principal exports are cider, perry, cattle, horses, and the products of the different manufactures. The capital is Evreux (q.v.).

Eure-et-Loir, a French department lying next to that of Eure, and having an area of 2,267 square miles. It is mostly a large plateau, which in the W. is diversified by valleys and streams. A ridge running from S.E. to N.W. makes the principal watershed, the northern basin of which has the Eure, which flows into the Seine, and the southern the Loir, which flows into the Sarthe 13 miles above its junction with the Loire. There are tributaries of each of these rivers, and there are also small lakes. The land produces good wheat, and there are numerous water-meadows. Many apples are grown for cider, and vines are abundant, but produce inferior wine. Game abounds, and poultry are reared for the Paris market. There is some iron, but it is little worked; and there are few manufactures, the department being chiefly agricultural. The capital is Chartres.

Euripides (480–406 B.C.), an Athenian poet, said to have been born at Salamis on the day of the defeat there of the Persian fleet, though other accounts put his birth at an earlier or later date. He began by studying painting, and then rhetoric under Prodicus, and philosophy under Anaxagoras. He is said to have composed tragedies at 18, and to have brought them forward in public competition in 455, though it was not till 441 that he gained a first prize. *Orestes* was brought forward in 408. For some reason he left Athens, and went to the court of Archelaus, King of Macedonia, who had a great regard for him. Indeed, he seems to have had a higher reputation abroad than at home, if stories are to be believed that some Athenian prisoners found their lot much bettered through their being able to recite his works, and that a ship pursued by pirates was admitted to a harbour of refuge only through a similar power. The Athenians are said to have wished to have his dead body from Macedonia, but were unable to obtain it from Archelaus. A statue was, however, erected to him at Athens. Of his plays 18 are extant, and there are many editions of them. He abandoned the heroic and stormy style of Æschylus for one more fitted for the softer emotions, and the waning fortunes of Athens seem to have inspired him with a feeling of pathos. His handling of women has gained for him the reputation of a misogynist.

Europe is the smallest of the three continents of the Old World, and the smallest of all the five continents of the globe with the exception of Australasia. Its length from Cape Matapan, in latitude 35°, to North Cape, in latitude 72°, is 2,550 miles; and its breadth from Cape Clear, in Ireland, longitude 10° W., to the Ural Mountains, longitude about 60° E., is 1,900 miles. It is bounded on every side but the E. by the ocean. The Atlantic washes its western shores, the Mediterranean its southern, while the semi-frozen Arctic Seas hem it in on the north. Only its eastern boundary is artificial, and, to some extent, indefinite. The generally accepted eastern boundary-line starts from the Bosphorus, follows the Euxine shore, then the Caucasus watershed, till it reaches the middle of the Caspian, when it trends in a north-easterly direction, and reaches the White Sea by a course roughly parallel with the Ural river and the Ural mountains. This somewhat hazy frontier has long formed one of the chief political dangers in Eastern Europe. The continent has sometimes been regarded as a peninsula of the neighbouring Asia, from which it is only separated at its south-east corner by the narrow Bosphorus, which bisects the isthmus connecting Europe and Asia. Indeed, all three may be regarded as parts of a single primeval continent.

Europe has an area of 3,800,000 square miles, and is divided unequally from east to west by lofty mountain ranges—a fact (as we shall see farther on) which has mainly shaped the course of its history. Southern Europe embraces three great peninsulas, Greece, Italy, and Spain, besides several large islands and numerous clusters of smaller ones. It is watered by the Mediterranean, the largest inland sea on the globe, being 2,000 miles in length and 600 miles in breadth. This great inland lake, with its secondary seas, affords easy access not only to the heart of Southern Europe, but to the northern coasts of Africa, and the south-western shores of Asia. Its deeply indented littoral has not only given salubrity to the climate, but afforded vast facilities also to inland and foreign commerce. To the north of the central mountain chain lies a widely different country. The northern half of Europe projects, as does the southern, several large peninsulas, the Scandinavian, consisting of Sweden and Norway; Denmark; and Russian Lapland, or Finland. A small part of Northern Europe lies within the Arctic circle, the rest being in the temperate zone.

The chief continental peninsula—Scandinavia—contains the principal mountain axis of Europe, which, commencing in the Pyrenees, continues through the Alps, and extends in a circuitous course through the mountains of Dalmatia, Albania, and Greece, right up to the west frontier of India. The Western Alps are the boundary of the two great basins which form together Western Europe. That south of the Alps, which stretches to the Atlas range in North-West Africa, contains the western section of the Mediterranean, whose depth may be judged from the fact that it has been sounded to 13,000 feet, only 2,780 less than the height of Mount Blanc. North of the Alps a much smaller, shallower, and entirely land basin is formed. Starting from the Alps near Geneva, it sweeps northward and then eastward to meet the spurs of the Alpine chain on the Danube. These two basins constitute the chief mountain regions of Europe. Beyond them lies the great plain of Northern Germany, 600 miles long, whose lowest depression is the shallow Baltic. In these mountain ranges lie the sources of all the great international rivers. None are found south of the Alps, owing to the short distance from the Mediterranean, which does not permit of

MAP OF EUROPE.

SHOWING DENSITY OF POPULATION

Scale of English Miles

100 0 100 200 300 400

Inhabitants per Sq Mile

- Less than 10
- Between 10-50
- 50-100
- 100-150
- 150-250
- 250-500
- Above 500

5 Long. W. of Greenwich. 0 Long. E. of Greenwich. 5

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the accumulation of a sufficient body of water to form a river of the first magnitude. To the north of Europe we owe such streams as the Rhone, the Rhine, and the Danube; but Europe generally is richer in inland lakes and rivers than any other continent. The peninsular character of Europe contributes largely further to the salubrity of its general climate. The aërial currents from the Atlantic render arid deserts like those of Asia and Africa impossible, while the tempering breezes of the Mediterranean and its secondary seas make Southern Europe one of the paradises of the globe. Another striking advantage which Europe possesses is the uniformity of several of its most important productions. Wheat, for example, can be grown from Archangel to Sicily, and its soil will yield in abundance every cereal or fruit for which a tropical climate is not essential. Man, again, and nearly all of the fauna of Europe can live in any part of the continent which lies within the temperate zone. The sea-board of Europe is of enormous length compared with its area, extending 84,000 miles, and exceeding that of Africa, which is three times its size. The Mediterranean littoral alone measures about 13,000 miles. Geographically Europe is the garden of the world, and this fact alone may account for its long supremacy over other continents. It possesses, again, another geographical advantage not enjoyed by the rest. London is nearly the centre of the *land* hemisphere, and its proximity to the American continent has caused the very large emigration from Northern and Southern Europe to North and South America respectively. This is one main secret of the spread of European peoples over the fertile lands of the West.

The geological remains of the extinct fauna and flora of Europe show that before the glacial period it had a tropical climate, during which it seems certain that *man* existed on the continent.

The *population* of Europe is estimated at 380,000,000, or an average of 87 to the square mile—a ratio higher than that of any other continent. Though it produces the precious metals in smaller quantity than the other four continents, it is rich in carboniferous deposits, as also in iron, copper, lead, tin, and other useful metals.

The *physical configuration* of Europe (referred to above), divided as it is almost from E. to W. by lofty mountain ranges, shows how it must have been first settled in historic times. The southern or peninsular half, with its numerons islands and seas deeply indenting the land, was naturally the region to be first peopled. It possessed a genial climate and a fruitful soil. It was close to the ancient civilisations of Asia and Africa, which, like itself, formed part of the Mediterranean littoral, and which had been probably the cradle of the world's history. Northern Europe, on the other hand, was covered originally by dense forests and wide morasses over much of its surface, which made its climate less hospitable and its soil less fertile. It was isolated further from existing civilisations by a difficult mountain barrier—all which kept it in a state of barbarism for centuries after the great commonwealths of Greece had declined, and the Roman Empire was approaching the zenith of its power. With one notable exception—Greece, whose high civilisation antedated by several centuries the dawn of the Roman Empire—that Empire is the pivot on which all European history turns. The barbarous tribes of the continent it subdued and absorbed first emerge from obscurity when Rome invaded their territories or they raided its borders; and their actual history as nations begins from the date of their final subjugation to the Roman arms. The kingdoms and republics of modern Europe all bear, again, more or less distinctly, the imprint of *Rome*.

The European races (with the exception of Turkey) all belong to the *Western* branch of the great Aryan family, whose earliest settlement has usually been located in Central Asia, at present peopled by its Eastern or Semitic branch. At some time both must have had a common language and *some* knowledge of the useful arts, as evidenced by the community of certain words in all European as well as Asiatic tongues, many of whose peoples can never have had any intercommunication. These Aryans spread over Europe in historic times in three great waves. The first occupied Greece and Italy, and are now known as *Celts*, dialects of whose language still survive in Wales, Ireland, and elsewhere. The second, known as *Teutons*, occupied Western Europe, and are the progenitors of the German and Scandinavian races, to the former of which we ourselves mainly belong. The third wave brought in the *Slavs*, who occupied that part of North-Eastern Europe known as the Balkan Peninsula, and are the progenitors of the Sclavonic races. The chief exceptions to a pure Aryan occupation are (omitting Turkey, which is Semitic) the *Magyars* of Hungary, the *Basques* of the Pyrenees, and the *Finns* of Lapland.

For us the real *history* of Europe begins with Greece. It divides itself naturally into three periods:—(1) Pre-Roman, (2) Roman, (3) Teuton, or, in other words, *Greek*, *Roman*, and *Teuton;* and of these ROME is the great central point, to which all history before it looks forward, and all history after it looks back. European history, then, commences with Greece. Her story, whose beginnings are lost in fable and myth, is a marvellous one. Her political life forms to-day the model of the civilised world. Her statesmen, her orators, her poets, her philosophers, her historians, her sculptors, and even her generals, have had rivals, but no superiors. The Persians invaded Greek territory nearly 500 years B.C., and the Greek victory of *Marathon* over those barbarians ranks now as the first decisive battle of the world. Historians so famons as Herodotus, Thucydides, and Xenophon have immortalised the triumph of Greek arms in the long Persian and Peloponnesian wars. Alexander the Great, one of the central figures of the world's history, achieved the complete conquest of Persia after a campaign of only six years. He also subdued Tyre, and made Egypt the vassal of Greece, with other conqnests never equalled in extent and importance, if not in duration, by any prince before or since. Greece must remain to all time the wonder of the world, displaying, as she did, on

so narrow a stage and in so brief a period, an exemplar which has, perhaps, never been approached since.

At the beginning of the 3rd century the independence of Greece had been lost, together with many of her foreign conquests and colonies. Rome began to intervene in her affairs, and for long centuries after, as well as before, the great Roman Empire completely fills the stage of European history.

The city on the Tiber which became the capital of that Empire is said to have been founded by Romulus, a descendant or son of the Trojan hero Æneas, who escaped into Italy after the fall of Troy; but the story of early Rome, like that of early Greece, is lost in myth. The territory over which it originally held sway was far from conterminous with modern Italy. Rome was originally a small city on the Tiber, built by the Latin tribes to overawe, or defend themselves against, the Etruscans, who had been earlier settlers in the north-western part of the *peninsula proper*, known as Etruria. The generally accepted date of the foundation of Rome is B.C. 753. Its earliest government was one by kings; but of cities, rather than of territories, when the form of government became by degrees republican. The commonwealth which succeeded, after enduring many changes, came to an end in reality (though several times revived later) with the accession of Augustus Cæsar in 27 B.C. The early centuries of Rome's existence are very much a record of the numerous wars waged with hostile tribes occupying the peninsula. There she received her training as a martial nation, and displayed the martial prowess which eventually subdued the world. It was not till about 343 B.C. that she accomplished the conquest of all *peninsular* Italy, which occupied sixty years. The Commonwealth was, in many respects, the most glorious epoch of her history, and in that period were laid the foundations of her enduring fame. Its later years were made memorable by the Punic wars, the third of which ended with the destruction of Carthage and the creation of the Roman province of *Africa*. She next swept Greece and Macedonia, and founded the Roman province of *Asia*. Leaving now nations to some extent civilised like herself, she turned to her native Italy and subdued Cisalpine *Gaul*. This completed her *Italian* conquests, and she was now mistress of the entire Italian *peninsula*. She next attacked the third southern peninsula, and early in the 2nd century conquered *Hispania* and made it a Roman province. Crossing the Alps, she next attacked Transalpine *Gaul*, to be met by a simultaneous invasion of the Cimbri or *Teutones*, in the encounter with whom she came off final victor. Rome was now mistress of the entire Mediterranean littoral, with the exception of Egypt. This vast domain was governed directly from Rome by means of proconsuls, and over its wide extent Roman laws prevailed, and the civilisation of Rome gradually spread. We pass over the great Mithridatic wars, the Servile wars in Italy, and the many internal distractions of Rome; the conquest of *Syria*, and its erection into a Roman province, and come to one of the era-making events in Roman history. We refer to the extension of Roman *Gaul* to the banks of the Rhine by Julius Cæsar—a conquest which first brought the two great divisions of Northern and Southern Europe face to face. It was this same Cæsar who effected the landing in Britain, though *Britain* was made a Roman province later; and it was in the reign of his grand-nephew that Rome completed the circuit of the Mediterranean littoral by the annexation of *Egypt*. Julius Cæsar may be regarded as the *actual* founder of the Roman *Empire*, which reached its zenith in the reign of his grand-nephew, who first bore the title of *Augustus*, and is known in history as Augustus Cæsar. The Roman Empire now included the whole civilised world. Its frontiers were the *Rhine*, the *Danube*, the *Euphrates*, and the great *deserts of Africa*, and it stretched 1,000 miles from east to west, and 1,000 miles from north to south—a marvellous achievement for a people who possessed neither of those powerful aids to modern conquests—gunpowder and steam navigation.

The great secrets of the rapid rise of this vast empire were that military discipline and civilisation which were then for the first time in history opposed, on any great scale, to barbarism. Rome had next the wisdom to confer her citizenship, not only on her allies, but on the nations she subdued. *Civis Romanus* became one of the proudest of the world's titles. Roman *laws* again, Roman *civilisation*, and Roman *roads* followed in the train of the Empire everywhere.

The reign of Augustus Cæsar was the golden age of the Roman Empire. The *Augustan age*, as it has been named, produced orators, historians, and especially poets, whose productions have ranked as the classics of every succeeding age, and, with those of illustrious Greek writers, have been the foundations of all liberal education ever since. The accession of Augustus Cæsar may, perhaps, be regarded, strictly speaking, as the beginning of the Roman Empire, which succeeded the long 700 years of early kings and later commonwealths; and it only ended, shorn of the last fragments of its once vast territories, on the fall of Constantinople in A.D. 1453.

The rise of Christianity in the early years of the Roman Empire in one of its obscure provinces in South-Western Asia; the gradual spread of the new faith over the whole Empire; the conversion of the Emperor Constantine in the 3rd century; and the final overthrow of paganism in the Roman dominions within 400 years, are, perhaps, the most memorable events in the history of Europe and of the world. Not only has the faith of Europe been changed, but Christianity has since become the religion of a large part of Africa and of parts of Asia, as well as of the two youngest continents; and it is being steadily propagated among heathen peoples in every quarter of the globe.

We now proceed to a very superficial survey of the leading events which tended to *the transfer of the balance of power in Europe* from the Latin to the Teutonic and allied races. Rome received her first serious check in an unsuccessful attempt to subdue the Germans *beyond the Rhine*. If that region had become a Roman province, the whole course of European history might have been changed.

PHYSICAL MAP OF EUROPE

Scale of English Miles
0 50 100 200 300 400

Explanation

- Below Sea Level
- Sea Level – 1,000 feet
- 1000 – 2,000 ,,
- 2000 – 5,000 ,,
- 5000 – 10,000 ,,
- Above 10,000 ,,

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The defeat of Rome weakened the *prestige* of the Roman Empire in the West, and stemmed the march northwards of its till then invincible arms. The Teuton had now learnt his strength, and his subsequent successes on the borders of the Roman Empire in Western Europe were much accelerated by the pressure from behind of a great Turanian invasion—that of the *Huns*—who occupied part of the northern shore of the Black Sea, and who had lately been driven out of China. The Goths, a Teutonic people, who had recently formed a powerful kingdom on the *north* of the Danube, the site of the abandoned Roman province of Dacia, were driven by this *force majeure* into Roman territories *south* of the Danube. There they made a permanent stand. Other Teutons pressed into *Gaul*, and from Gaul into *Spain*. At length a common danger united all the Western peoples of Europe to withstand an invasion led in person by Attila, the renowned King of the Huns. His signal defeat at *Châlons* was one of the decisive battles of the world. An adverse result might have driven Europe back into the barbarism of Asia. The gradual spread of the *Teuton* over the whole of Europe south of the Rhine, and as far to the south-east as modern Turkey, led to the formation of those various hybrid peoples known in history as the *Romance* nations of Europe. These people are a cross more or less pronounced between branches of the barbarians of Central and Western Europe and the Latin and other races of the Italian peninsula, with some admixture of Greek blood. In the reign of the German Emperor of the West, Theodoric (about 500 A.D.), the transformation of Europe may be said to be complete. The countries now known as Spain and Portugal, with France to the west of the Rhone, formed the *West Gothic* Kingdom, with the exception of the small Suevic or *Swabian* Kingdom, at the north-west corner of modern Portugal and Spain. The part of modern France which lies east of the Rhone was a *Burgundian* kingdom: north of both was the *Frankish Kingdom*, the present German Empire; and north of it again, *Saxons and Danes* (the former of whom had also effected settlements in south-eastern *Britain*) occupied the site of the modern duchies of Schleswig and Holstein, Denmark, and the southern parts of Sweden and Norway, while Celts occupied the rest of Great Britain and Ireland. Italy and part of Austria were the East Gothic Kingdom. Only the present Turkey and Greece remained to Rome in Europe. All these vast changes were the slow growth of long time, and were not effected without many protracted struggles; but the stronger race eventually supplanted the weaker. The Roman Emperors of the West ceased to be *Latin* and became *Teutonic* of various branches. With the transference of the seat of empire from the West by Constantine to the old Greek city *Byzantium* on the Bosphorus, and hereafter known as Constantinople; the conversion of the Emperor to Christianity; the formal recognition of Christianity as the religion of the Empire, the *Germanising* of the Roman Empire in the West may be said to be nearly complete—though the dynastic changes we have glanced at were not fully concluded for more than a century afterwards. It was henceforth the *Roman* Empire only in name. The erection of *New Rome* on the banks of the Bosphorus was the great political division of the Empire. It was now split in twain into two sections, an Eastern and a Western—the one *Greek*, *Asiatic*, and *African*, the other *Teuton*—just as the Church of Rome was divided into two great communions of Eastern and Western by the dispute about images. The result was a *Teuton* and a *Greek* empire, and a *Roman* and *Greek* communion. The transfer of the seat of government from Rome to Milan accelerated perhaps the fall of the Western Empire. Rome was taken A.D. 476 by Odoacer, who assumed the title of King of Italy, and an Empire which had weathered ten centuries ceased to be. It still lingered on, in name at least, in the far East, when it finally expired, gradually shorn of its power and of the last vestige of its once world-wide possessions, when Constantinople was sacked by the Ottomans. This is a mere rough outline of leading events in European history, the details of which (including the rise of the Ottoman power) must be sought from other sources. The rise to the first rank of the great kingdoms of France and Spain, the first coming to the front of the *Low Dutch* races of Holland and England, the rise of the great semi-Asiatic empire of *Russia*, the establishment of the United States of America, can only be just mentioned as landmarks on the chart of European history.

With the fall of Constantinople (A.D. 1453) the Eastern half of the Roman Empire, or what fragment remained of it, was usurped by a great Ottoman power, and a Mohammedan and Semitic people gained a settlement in Southern Europe.

The fall of the Western Empire was the real origin of the temporal power of the Popes. They had always acted as the vicegerents of the often non-resident German and other emperors, and when the capital was finally abandoned they grasped the fallen sceptre. Revolution and anarchy beset the once capital of the world. The Popes suffered many years of exile; but when they returned to the Christian Zion they resumed their old authority. Their rule was, on the whole, beneficent in a dark and lawless age, if it was sometimes abused. Their territorial dominions in Italy belong to a later period.

We can only just mention such facts as being the germs from which mediæval and modern Europe were gradually evolved. Nor can we do more than make a passing allusion to that great wave of religious enthusiasm which in the 11th, 12th, and 13th centuries sought to wrest the Holy Land from the grasp of the infidel Saracens. The growth of *monastic institutions* led to a great revival of learning in the Middle Ages; and the increasing hold of the Christian faith on the minds of men is strikingly illustrated by the splendid ecclesiastical structures which stud the land, and remain now the undying monuments of the piety of those distant times which a more sceptical generation has designated the Dark Ages. The great religious revolt against Rome, which lasted in various countries of Europe from the 10th to the 15th century, marks that new era of religious

liberty which over a considerable part of the Christian world has succeeded the spiritual slavery and superstition which prevailed to some great extent in the Middle Ages. The French Revolution in the 18th century marks equally the fall of that monarchical and military despotism which had spread so widely over Europe, and the rise of civil liberty everywhere on its ruins. But we must draw this mere "bird's-eye view" of the subject to a close. The Teuton, mixed with the Celtic and old Latin races of Italy, lords it already over three continents and half of a fourth, and he sways the great Asiatic peninsula of India. Only Russia remains the enigma in the future course of European history. The long-vexed "Eastern Question" may yet again change the face of Europe. The unification of the great races of Northern Germany, the rise of the little kingdoms of Italy and Greece, the struggle for political independence among the Sclavonic races of the Balkan peninsula—all these are symptoms of a vigorous national life in Europe; but the English race still leads the van of Teutonic progress. The old empire of Rome was insignificant compared with that of Great Britain.

Such is the splendid fabric which has risen in twenty-six centuries from the little seven-hilled city on the Tiber—well named the Eternal City.

Euryalida, the group of Ophiuroidea (q.v.) which includes those with many and twining arms, such as the Medusa Head (*Astrophyton*). The earliest known members of the class are the *Eucladia*, from the Silurian rocks of Dudley, and the *Onychaster*, from the Carboniferous of Illinois.

Eurydice, a well-known character of classic fable. A snake-bite led to her passage from earth to Hades, and her husband, Orpheus, whose lute charmed stocks and stones and subdued savage beasts, set out to try the effects of music on the powers below. He silenced Cerberus, and drew iron tears down Pluto's cheek, and his wife was restored on condition that he should not look at her as she followed him till they reached the upper air. His great love was not proof against temptation. He turned, looked, and lost her. The story is prettily told by Virgil in the *Georgics*.

Eurypterida, an extinct order of *Arachnida*, which occur principally in the Upper Silurian and Devonian rocks. The three best-known genera are *Eurypterus*, *Pterygotus*, and *Slimonia*. They were all marine, and swam about by means of four pairs of large appendages around the mouth. There were no limbs on the abdomen, but this ended in a large, expanded telson. The order has certain affinities with the Trilobites, and both were once included among the Crustacea.

Eusebius (265–340), the earliest of Church historians, was born in Palestine. In 315 he was Bishop of Cæsarea, and from being an opponent of the Arians he ended by siding with them against St. Athanasius. He wrote a history of the Church from the birth of Christ to 324, in Greek. There are several editions and translations of it. Of his *Chronicon* there are fragments, and a translation by St. Jerome. He wrote a *Præparatio Evangelica* in 15 books, and a *Demonstratio Evangelica* in 20 books, of which 10 exist in an imperfect form. He also wrote a notice of the Emperor Constantine. It is a question how far his history is to be trusted.

Eustathius, a Greek commentator of the 12th century, was a native of Constantinople and Archbishop of Thessalonica and of Myra. He was a great classical scholar, and commented upon Homer and Dionysius. Much of the value of his writings consists in his quotations from works now lost.

Euthanasia (Gk. *eu*, well, *thanatos*, death). About 1873 it was proposed that in all cases of incurable disease it should be the recognised duty of the medical attendant painlessly to put the sufferer to death. But there are obvious objections to it, grounded especially on its ethical dangers. The word is older in the sense of a painless death.

Eutheria, a sub-class of Mammalia (q.v.) comprising the placental mammals.

Eutropius Flavius was a Roman historian who lived in the 4th century, but of whose history and birthplace little, if anything, is known. He served under the Emperor Julian, and is known by his *Breviarium Historiæ Romanæ*, an epitomised history of Rome from its foundation down to the time of the Emperor Valens.

Eutyches, an ecclesiastic of the 5th century, was the superior of a monastery near Constantinople. He was at first inclined to the Nestorian heresy that Christ possessed two distinct natures, but afterwards adopted a modification of the Monophysite heresy, and for this he was excommunicated by the Council of Constantinople in 448. He was afterwards restored, to be again condemned, together with the Nestorians, by the Council of Chalcedon in 451. From that time he disappears from history, but his views were continued by a sect which bore his name.

Evander, a son of Hermes and an Arcadian nymph, who being for some cause compelled to quit the country and his native town Pallantium, about sixty years before the date of the Trojan War, went to Italy with a colony of Pelasgians, slew the king of Præneste, and built another Pallantium at the foot of what was afterwards the Palatine hill, and proceeded to civilise Latium, introducing literature, agriculture, music, and the worship of his native Greek gods. Æneas is said to have been well received by him.

Evangelical, Evangel (*Gospel*), in a strict sense, that which has to do with or partakes of the nature of the Gospel. In a wider sense it is applied to such sects or religions as aim at regulating their lives by the Gospel. It is also applied in a special sense, as for instance to the National Church of Prussia, or to that party in the English Church otherwise known as Low Churchmen.

Evangelical Alliance, a confederation of evangelical denominations, first instituted at a World's Convention at London in 1846, and having for its object the promotion of Christian intercourse among orthodox Protestant denominations and co-operation in good works.

Evangelical Union, THE, was founded in 1843 by several Scottish ministers, the chief of whom was James Morison, of Kilmarnock, who had been expelled from the United Secession Church for holding anti-Calvinistic views. From him they are sometimes called Morisonians. In Church government they are Independent, in doctrine Arminian.

Evans, SIR DE LACY (1787–1870), an English general. He went young to India as an ensign, and saw some service there. In 1812 he went to the Peninsula, and took part in many of the chief engagements. In 1814 he went to America, where he was wounded, and arrived in Europe in time to take part in the battle of Quatre Bras. After the peace he gave his attention to politics, being ardent in the cause of Reform. In 1830 he sat in Parliament for Rye, and in 1833 for Westminster. In 1835 he took command of 10,000 troops, who were raised by permission of the Government to take part in the Spanish war against the Carlists, and he made good soldiers of them. In 1837 he was made K.C.B., and in 1846 Major-General. He took part in the Crimean War, and was present at Alma, Inkermann, and Sebastopol. He received the thanks of Parliament, the Grand Cross of the Legion of Honour, and the G.C.B. He then returned to politics and Parliament.

Evaporation is a process of diffusion of the particles of a substance, either liquid or solid, into the surrounding medium. If from the solid state the process is called *sublimation*. If the transition from liquid to vapour, or from vapour to liquid, be perfectly free, which can only occur when the pressure of the vapour is sufficient to overcome the external pressure, the process is called *ebullition*, or boiling. [EBULLITION.] At any pressure a certain amount of evaporation may occur. Thus, even ice may evaporate, though it is obviously far below its boiling-point; and in course of time may entirely disappear. The amount of evaporation at a temperature below boiling-point depends chiefly on that temperature, but other local conditions, such as pressure, may also hold. Heat is required to effect the change from the liquid to the gaseous state, and inasmuch as this heat disappears as such, it is termed the *latent heat* of evaporation. If t is the temperature of free evolution of water-vapour Regnault gives the amount of latent heat as $606{\cdot}5 + {\cdot}305\,t$, the temperature and the heat unit being in degrees Centigrade. This production of cold, for as such the subtraction of heat may be regarded, is found practically useful. Liquid carbon dioxide may be in part frozen by the evaporation of part, a process that is applied in various other cases. [HEAT.]

Evelyn, JOHN (1620–1706), was born at Wotton, Surrey, where his family owned an estate. He studied at Oxford and at the Middle Temple, and then travelled for some time. His exertions for the Royalist cause won him consideration at Court after the Restoration. He was one of the early members of the Royal Society. In 1662 he published a *History of Engraving upon Copper*, but the work by which he is chiefly known is the *Sylva* (a treatise on forest-trees), with its appendix *Pomona* upon fruit-trees. In James II.'s reign he was one of the Commissioners of the Privy Seal, and after the Revolution he was made treasurer of Greenwich Hospital. His diary and correspondence have been published, and many miscellaneous works on gardening, architecture, medals, a burlesque account of women's toilet called *Mundus Muliebris*, and the *Fop's Dictionary*.

Everest, MOUNT, a name given to Gaurisankar, a peak of the Himalayas in Nepaul, in honour of Sir George Everest, Surveyor-General of India. It is the highest measured point of India and of the globe, being over 29,000 feet high.

Everett, ALEXANDER HILL (1792–1847), an American diplomatist, born at Boston. He studied law under John Quincey Adams, with whom he went to St. Petersburg (1809–1812). He next practised law for a time, and was then appointed secretary of legation in Holland, and (1818–1824) *chargé d'affaires*. From 1825 to 1829 he was in Spain, and was elected a senator of Massachusetts on his return. In 1840 he was sent on a mission to Cuba, and in 1846 to China, where he died. He produced a work upon Europe (1822), and one on America (1827).

Everlasting Flowers, various species of the genera *Helichrysum*, *Helipterum*, *Xeranthemum*, etc., belonging to the order *Compositæ*, which agree in having an imbricate involucre of dry or "scarious" bracts, often brightly coloured and retaining much of their beauty when dried. *Helichrysum orientale*, the "Immortelle" of the French, with small yellow heads of flowers, often bleached or dyed black, green, or orange, is a native of Crete and North Africa; but most of the species are natives of South Africa, Australia, and Tasmania. Yellow, pink, crimson, and white are the chief natural colours of the bracts of the various kinds. They are largely used for funeral wreaths.

Eviction, dispossession or ouster of possession. The term is generally applied to ouster from real property only, but it is also applicable to dispossession from personal estate. The usual covenant for quiet enjoyment contained in leases and other deeds is practically a covenant against eviction. A landlord may legally evict his tenant for good cause, but he will be guilty of a wrongful eviction of his tenant if he, without proper cause, actually or physically, evicts him, or does any act of a permanent character with the intention of evicting, and which is inconsistent with the tenant's returning or continuing in possession.

Evidence consists of facts brought forward for judicial or other purposes as the maintenance or refutation of a proposition of any kind. By the law of England the body of rules known as the law of evidence has been gradually established during this and the last century. It is a system of restrictions upon the admission of testimony, showing that in this country, at least, the inclination has, up to a comparatively recent period, been to circumscribe and not to extend the admission of evidence. In our earlier judicial proceedings the practice was

to admit without hesitation or question every species of testimony, whereas the existing law of evidence is largely composed of restrictive rules, though these have in recent years been considerably relaxed.

Evidence in a legal sense must be either oral or written, and is always given on oath of the party, except in the case of Quakers and Moravians, but the form of the oath is immaterial. A Christian is sworn upon the Gospels; a Jew upon the Old Testament, with his head covered; and a Mohammedan or other non-Christian in such form as he considers binding on his conscience. All persons who have understanding enough to know the nature and obligation of an oath are admissible as witnesses.

As a general rule, the party who affirms a thing must prove it, and he must give the best evidence which the nature of the case requires, and, as a general rule, hearsay testimony is not admitted; but there are exceptions to this rule, as, for instance, the testimony of dying persons [DECLARATION], the declarations of deceased persons made against their interest and respecting rights of a public nature, such as the boundaries or general customs of a manor or district.

Written evidence consists of records, documents under seal as charters, and deeds and writings not under seal. Acts of Parliament are records of the highest nature, being the memorials of the legislature. There is, however, a distinction between public and private statutes. A public statute requires no proof in courts of justice, but private statutes must be evidenced by comparison with the originals. A second and inferior kind of records is the proceedings of courts of justice, which are evidenced by exemplifications sworn and office copies. Exemplifications are transcripts of the records of different courts accredited by having the seals of such courts attached. Sworn copies are transcripts made by individuals, who authenticate them upon oath when they are produced in evidence. Office copies are copies certified to be true and accurate by an officer expressly intrusted with that business of the court to which the records belong.

The present leading rules of evidence are as follows:—

1. The sole object and end of evidence is to ascertain the truth of the several disputed facts or points in issue, and no evidence should be admitted which is not relevant to the issues.

2. The point in issue must be proved by the party asserting the affirmative, according to the maxim *affirmanti non neganti incumbent probatio;* but where one person charges another with a culpable omission or breach of duty this rule will not apply, for the person who makes the charge is bound to prove it, though this may involve a negative, since it is an established principle of justice not to presume that a person has acted illegally till the contrary is proved.

3. It is sufficient to prove the substance of the issue.

4. The best evidence must be forthcoming of which the nature of the case is capable.

5. Hearsay evidence of a fact is not admissible. (*See* above.)

6. No person is bound to criminate himself for *nemo tenetur prodere se ipsum*. The mode of taking evidence in the Common Law courts differed from that which was usual in the Court of Chancery. It was oral in the former and by affidavit in the latter. Now, however, that there is one Supreme Court, the ordinary mode of taking evidence is by oral examination of witnesses; but by agreement or by leave of the court or a judge affidavits or depositions may be used in the Chancery division.

Witnesses in courts of law are produced before the court and examined by counsel, after which they may be cross-examined by the counsel for the other side.

When the evidence is completed on both sides, the judge, in the presence of the parties, the counsel, and all others, sums up the whole to the jury, recapitulating in greater or less detail, as he may deem necessary, the statements of the witnesses, and the contents of the documents adduced on either side, commenting upon the manner in which they severally bear upon the issue, and giving his direction upon any matter of law that may arise upon them, but leaving the jury to determine for themselves the credit and weight to which they are respectively entitled, and to decide whether, upon the whole, the preponderance of proof is in favour of the plaintiff or defendant.

The jury, after the proofs are summed up, if they express a wish so to do, withdraw from the court to consider their verdict, and are kept till they are all agreed.

Trials may, however, now be before a judge or a judge with assessors alone without a jury, and a notice of trial given generally means a trial before a judge without a jury.

In the United States there is now, in consequence of recent legislation, scarcely any restriction as to admission of evidence.

Circumstantial Evidence is the term applied to *indirect* as opposed to *direct* evidence; such evidence is also sometimes known as "presumptive," because when the fact cannot be established it may be presumed by the proof of such circumstances as usually attend such fact. [PRESUMPTION.]

Evil Eye, a term used to denote the widespread superstition that certain persons can exercise a pernicious or blighting influence on other persons or on the lower animals by looking upon them. This superstition existed in classic times. There are two distinct forms of this fascination or bewitching: in the first, and more usual kind, the ill effects are willed by the possessor of the evil eye; in the second, these effects are produced involuntarily, or even directly against the will of the person endowed with this terrible power. The exercise of the first form is popularly known as "overlooking," and a person suffering from its blighting influence is said to be "overlooked." These words have lost this meaning in modern English, but examples will be found in Pistol's reproach to Falstaff (*Midsummer Night's Dream*, v. 5) and in Portia's exclamation to Bassanio (*Merchant of Venice*, iii. 2); whilst many other instances of about the same date might be cited.

The English notion of the evil eye is capitally expressed in Kingsley's translation of Lucy Passmore's hints :—"If you trouble me, I will overlook (*i.e.* fascinate) you, and then your pigs will die, your horses stray, your cream turn sour, your barns be fired, your son have St. Vitus's dance, your daughter fits, and so on, woe on woe, till you are very probably starved to death in a ditch, by virtue of this terrible little eye of mine" (*Westward Ho!* ch. iv.). And the race of "Lucy Passmores" has not yet died out. The second form is chiefly found in Southern Italy, where it is known as *la gettatura*. The possessor of this fatal power is usually a man, frequently a cleric, and it was attributed to Pope Pius IX., though in former times the power of the evil eye was supposed to belong almost exclusively to women. Against both forms amulets and charms were and still are employed. Spitting on the ground was supposed to be an infallible safeguard. With regard to the origin of this superstition, Dr. Tylor says "that it seems not unreasonable to suppose that the belief in the mysterious influences of the evil eye flows from what the eye can do as an instrument of the will. The horror which savages so often have of being looked full in the face is quite consistent with this feeling. You may look at him or his, but you must not stare, and above all you must not look him full in the face—that is to say, you must not do just what the stronger mind does when it uses the eye as an instrument to force its will upon the weaker."

Evolute, in *Geometry*, is the term applied to the envelope of the normals to a curve at every point, the normal being the line at right angles to the tangent at its point of contact. The given curve is called the *involute* (q.v.), and from the definition it follows that if a thread be regarded as lying along the one evolute, its end point when unwound on the convex side of the curve traces the other involute. Thus, the involute of a circle is a spiral of special type, as may be shown practically by unwinding a thread from an ordinary reel. The evolute of this special curve is the circle itself. [INVOLUTE.]

Evolution. 1. In *Algebra* or *Arithmetic*, is the inverse process of *involution* (q.v.), and as such requires a primary knowledge of the latter. Its manipulation is either effected directly by systematic guess-work, known as the process of square-root, cube-root, and the like, or indirectly by the same through the medium of logarithms. But the latter being applicable only to known numbers, can be used in arithmetical evolution only; nevertheless, its general applicability in solving any root whether integral or fractional renders it highly useful.

2. A theory which regards all higher or more complex forms of existence as following and depending on lower and simpler forms—the cause of this gradual transition being immanent in the lower form of existence which is thus transformed. It is thus an attempt to solve one of the two main problems of philosophy. The first of these problems is the ultimate nature of reality, or mind and matter in relation to one another, the statical aspect of the world: the second, which evolution attacks, is the dynamical question of becoming, how have things become what they are, and how are they now being changed. As a cosmogony (q.v.) evolution conflicts, at least partially, with the theory of emanation, which had an Oriental origin and was developed by the Neoplatonists, Gnostics, Arab philosophers and Cabalists, and with that of direct creation by a personal deity.

The foundation of the modern mechanical conception of nature and of physical evolution was laid by Descartes; added to by Leibnitz's theory of sentient monads; illustrated from the history of human progress by Pascal, Priestley, and Lessing; applied to the heavens by Kant and Laplace; and to the whole of nature and mind by Schelling and Hegel. The theory of descent or the derivative origin of existing species of plants and animals practically dates from the works of Lamarck and Treviranus in the first decade of the present century — neither Erasmus Darwin nor Goethe having essentially strengthened the position of the theory as more than a poetic fancy. The authority of Cuvier retarded the acceptance of the theory by biologists; but after the middle of the century many independent lines of research outside the field of biology prepared the way for its firm establishment.

Experiments on the mechanical production of heat and the chemical production of electricity led to the generalisation of the conservation of energy. The work of Black and Lavoisier in demonstrating the indestructibility of matter was extended by means of the spectroscope in the hands of Kirchhoff, Bunsen, Huggins, and others to the showing that the chemical elements of the heavenly bodies are the same as those of our earth. The same process of observation gave a firmer footing of fact to the nebular hypothesis of Kant and Laplace. The use of fossils by William Smith as indicating succession among sedimentary rocks, the restoration of these extinct forms of life by Cuvier and other palæontologists, and the insistence by Hutton, Playfair, and Lyell on the sufficiency of existing physical agencies to explain the facts of geology, called attention to the immensity of the age of the earth and to its having been successively inhabited by races of plants and animals different from, and in many respects lower than, those now living. The discoveries of McEnery and Boucher de Perthes in bone-caves and river-gravels conclusively established the great antiquity of man (q.v.) on the earth, and suggested his advance in culture from the most helpless barbarism; and the application of the comparative method to the study of languages prepared the minds of scholars for similar conclusions.

Cuvier had shown biologists the existence of fundamental types of structure in groups adapted to varied modes of life and the "serial homology" of parts, such as the limbs of animals and the leaves of plants, modified for distinct functions; and Von Baer's (q.v.) parallel between the development of the individual and that of the race had shown the bearing of embryology (q.v.). When, in 1858, Darwin (q.v.) and Wallace brought forward the principle of natural selection as the mode of

organic evolution, Mr. Herbert Spencer had already elaborated a consistent philosophy of evolution in which this principle readily found its place. In the *Origin of Species* the facts of the geographical distribution of organisms and of the existence of rudimentary or vestigiate structures were set forth in their true bearing on the general theory; and, so far as biology is concerned, the result of the last 30 years' investigations has been to make every biologist an evolutionist, though the relative importance of the principle of natural selection, of the influence of the environment (q.v.), and of other processes, in the production and preservation of varieties is still a matter of dispute.

Darwin suggests an ethical extension of his views in defining the general good as "the rearing of the greatest number of individuals in full health and vigour and with all their faculties perfect under the conditions to which they are subject," and Mr. Spencer similarly looks on human progress as a gradual process of self-adaptation of man to his environment—*i.e.* of increasing happiness. [DARWINISM, DEVELOPMENT, ENVIRONMENT, MIMICRY, NATURAL SELECTION, etc.]

Evora (ancient *Ebora*), a town in Portugal, capital of the province of Alemtejo, 80 miles E. of Lisbon. It was an ancient fortress, though its walls and defences are now in ruins, and the Moors received a memorable defeat there in 1166. It is the see of an archbishop, and the cathedral dates from 1186. There is a college and a seminary. The chief manufactures are ironware and leather, and there is an annual fair.

Evreux (ancient *Civitas Eburovicum*), the capital of the French department of Eure, 57 miles N.W. of Paris, in the valley of the Iton, which divides the town into three parts. It has a good cathedral, with a spire 256 feet high, an interesting abbey, and an hôtel de ville, which was once a palace of the Dukes of Bouillon. Among its industries are the manufacture of hosiery and leather, and there is a considerable trade in cattle, corn, seeds, and timber.

Ewald, GEORG HEINRICH AUGUST VON (1803–1875), a German Orientalist, was born at Göttingen, at the university of which he studied theology and philosophy, and became professor of philosophy and of Oriental languages. His protest against the revocation of the Hanoverian Constitution led to his deprivation, and he eventually obtained a professorship at Tübingen. He was one of the leaders of the so-called "Tübingen school" of rationalistic and critical theology. His career was much checked and marred by his refusal to acknowledge Prussian supremacy. He wrote many philological works, and had a special gift of insight for interpreting the genius of the Hebrew nation and its sacred writings. His *History of the People of Israel* is his chief work.

Ewald, JOHN (1743–1781), a Danish poet, was born at Copenhagen and educated in Schleswig. As a boy the reading of *Robinson Crusoe* made him run away in search of a desert island, and a few years later he ran away again and enlisted in the Prussian army, but being disappointed at being made an artilleryman instead of an hussar, he deserted to Austria, where he might have gained promotion if he would have changed his religion. He was bought off by his friends and returned to Copenhagen, where the success of an elegy upon Frederick V. of Denmark led him to turn his attention to poetry, and he became renowned for his lyric and tragic poetry. *The Death of Balder* is the best known of his works, which have been published in 4 vols. The poet died in what was almost poverty. He is the author of *King Christian stood by the Lofty Mast*, the national hymn of Denmark.

Ewe, properly EHWE (*pron. Ey-whey*), a numerous negro people whose various branches occupy a great part of the Slave Coast, Upper Guinea, between the river Volta on the west and Yoruba-land on the east, and extending for an unknown distance inland. Ewe-land thus comprises the kingdom of Dahomey and the whole region stretching thence westwards to the Ashanti and Ga peoples of the Gold Coast. The chief tribal divisions are:—Ehweawo, Anfueh, Krepe, Avenor, in the extreme west; Awuna, Aflao, Geng, on the coast; Ffon (Dahoman) and Ehwemi, in the extreme east; Krikor and Ataklu inland from the Kota lagoon; Makki (Mahi), Attakpami and Aja of the mountains in the far interior. According to the national traditions, the Ewe people migrated from these mountains seawards some centuries ago, and some of the national usages seem to imply close contact with the Saharan Tuaregs (Hamites) in their original homes. But if they were originally Hamites the Ewe have long been assimilated in appearance, customs, and language to the surrounding negro populations. Their speech is fundamentally connected with the Ga and Tshi of their western neighbours, and with the Yoruba on the east, all these being so many distinct branches of a widespread negro linguistic family which occupies the whole region from the Lower Niger westwards to the Ivory Coast. In this region the progress of culture has been from west to east, so that in this respect the Ewe take an intermediate position between the barbarous Tshi and Ga peoples of the Gold Coast and the semi-civilised Yorubas west of Dahomey. Formerly the Spanish and French planters of Central America, the West Indies, and Louisiana, drew their chief supply of slaves from the Ewe-speaking tribes exported from Whydah and Bagary; hence the term *vodu*, which in the Ewe language means a supernatural agency, is still current in various forms (*vaudoo, vaudoux*) amongst the negro peoples of Hayti, the Lower Mississippi, and other countries first settled by Spanish and French colonists. The vaudoo practices surviving in these regions are found nowhere in the parts colonised by the English, who imported their "Coromantees" mainly from the Tshi-speaking populations of the Gold Coast. The standard work on the Ewe nation is Major A. B. Ellis's *Ewe-speaking Peoples of the Slave Coast of West Africa*, London, 1890.

Ewing, JULIANA HORATIA (1842–1885), writer for children, daughter of Mrs. Gatty, was born in Yorkshire. The nursery plays which she composed as a child are said to have given her mother the idea of *Aunt Judy's Magazine*. Mrs. Ewing contributed to this, and succeeded her mother in editing it. Her tales are well known to both old and young.

Exanthemata, the class of fevers attended by skin eruptions—*e.g.* scarlet fever, measles, German measles, small-pox, chicken-pox, typhus, etc.

Excalibur, the magic sword which King Arthur received from the Lady of the Lake. Tennyson tells us how the "arm, clothed in white samite, mystic, wonderful," gave Arthur the sword, and received it again when Sir Bedivere flung it at the King's command into the mere.

Excavators are labour-saving machines much employed at present for the removal of earth in the making of docks, railways, and the like. They are of two kinds, the first being a single scoop raised or lowered by crane mechanism, and arranged with jaws that cut out a certain quantity of earth on being drawn together by steam or other such motive power. The second is precisely similar to the steam-dredger with its endless chain of buckets. [DREDGING.] The first possesses the advantage of variety in movement and general applicability, the second of economy in time required for the excavation of a given amount of material.

Exchange, in political economy, denotes first the practice—in its simplest form, barter—of a man's changing goods of which he has produced or obtained an excess, for goods of which another has an excess but of which he himself has need. Commercially the word often signifies the practice prevailing among merchants of different towns or countries of regulating their mutual accounts without the transfer of money from the one country or the other. To take the simplest form, the *bill of exchange:* suppose A in London buys goods of B in Antwerp. B has bought goods to a like amount in value in London. A, instead of remitting money to B in Antwerp, pays it over to B's London creditor on B's order, *i.e.* B "draws a bill" on A in favour of the creditor, and sends it to A for "acceptance." [DISCOUNT, BILLS.] The question as between countries is complicated by the different and varying proportion of the value of the currency of one country in the other, the prevailing rate of exchange, as it is called, requiring special adjustments. Exchange is "at par" when imports exactly balance exports, and the premium is a measure of the demand for bills, to save the risk of remitting specie. Exchange also is the name given to the building where merchants meet to adjust accounts and transact business. Such is the Royal Exchange of London, built by Sir Thomas Gresham in imitation of the Bourse at Antwerp. Exchange in law is where an estate is exchanged for one of similar value and limitation—*e.g.* fee-simple for fee-simple, life-estate for life-estate.

Exchanges, THEORY OF, in heat, is associated with the name of Prévost, who first definitely formulated it. A body possessing heat is continually giving out heat, either by conduction, convection, or radiation. This is the case whether the surrounding media are at higher or lower temperatures than the body itself. To take the one case of radiation, the amount of heat emitted is a function of the temperature of the body, and is constant if the temperature is constant. This is true for all bodies, and it must not be imagined that heat proceeds therefrom only in the event of these bodies being at higher temperatures than their surroundings. When their surroundings are at the same temperature they receive just as much as they emit, and their heat-intensity or temperature remains constant. When their surroundings are at lower temperatures they receive less than they emit and cool down in consequence; and conversely when they are at higher temperatures than their surroundings. If, therefore, a body having a good reflecting surface is placed in a medium bounded by another surface at the same temperature, it follows from the theory that inasmuch as its temperature remains constant it reflects much, radiates little, and absorbs little. If its surface is a good absorbent it reflects little but radiates much and absorbs much. Hence the general deductions that good radiators are bad reflectors but good absorbers, and that bad radiators are good reflectors but bad absorbers. [HEAT.]

Exchequer, in England, the financial department which receives or pays moneys due to or owed by the Government. The Chancellor of the Exchequer, now an officer of the Government, formerly had jurisdiction in the Court of Exchequer, which at first adjudicated upon cases in which the revenues of the Crown were concerned, but later, by a legal fiction, became an ordinary court of law. Its judges were known as Barons. The word is also used in the generic sense of a state treasury, and colloquially of any treasury public or private.

Excise, the name given to taxes or duties levied upon articles of consumption which are produced within the kingdom. There are, however, some duties to which the term is applied which can scarcely be called duties upon consumption, such as the sums charged for licences to permit persons to carry on certain trades or professions, as auctioneers, solicitors, etc., and the licences to kill or deal in game, keep dogs, etc.

Excise duties had their origin in England in the reign of Charles I., when a tax was laid upon beer, cider, and perry of home production by the Long Parliament in 1643. This Act prescribes also a list of foreign articles upon which excise duties were imposed in addition to duties of customs already chargeable. This Act was adopted and enforced under Cromwell, and by a statute passed in the reign of Charles II. the duties of excise were granted as part of its revenue to the Crown.

Excise duties are subject to the serious objection that the regulations under which they are collected interfere with processes of manufacture so as to prevent the adoption of improvements; hence their unpopularity in past times. But, however odious formerly to the people of England, these taxes are now viewed with more toleration, and are allowed

not only to be a convenient and effective species of impost, but to be attended with this collateral advantage—that the supervision of the revenue authorities tends to protect commodities subject to excise from fraudulent adulteration. The advantages, indeed, are such that, under recent Acts of Parliament, many imposts have been classed (probably for greater convenience in collection) under this head of duties, which are not (as before stated) properly in the nature of excise. To this branch of the revenue, which used to be (and, until the change contemplated by the Local Government Act, 1888, is effected, will continue to be) under the management of the Commissioners of Inland Revenue (together with that of stamps and taxes, with which it was amalgated in 1869), have also now been assigned not only the duties payable in respect of such licences as above mentioned, but duties on stage and hackney carriages, on railway passengers, on race-horses, on wine licences and refreshment houses, and also such as are known under the term of assessed taxes, these last being duties assessed and charged upon persons in respect of houses they inhabit, and of certain articles by them used or kept. And such assessed taxes comprise the duties on male servants, on carriages, and on armorial bearings.

In the United States the word excise has no official meaning, the analogous term there being "internal revenue," which is chiefly derivable from the taxes imposed on whiskey, tobacco, and malt liquors. There are also taxes on banks, etc., but stamps ceased to be a source of revenue after 1883.

Exciter, in *Electricity*, is an instrument for the production of electrification generally at high potential. Such instruments are usually designed on the principle of electric induction (q.v.).

Excommunication, an ecclesiastical punishment in Christian churches of being cut off from the privileges of church membership. It was a very real punishment in former days, when, in the case of private persons, the state enforced or allowed the penalties which it entailed, but modern views have made it only a spiritual penalty. Modern churches claim the right of exercising the power of excommunication; but it is a question how far, in states where the sovereign is the nominal head of the Established Church, the ecclesiastical authorities can go of their own motion. A clergyman exercising his supposed right of refusing communion to a parishioner is liable to a legal action.

Excretion, a term applied to material elaborated by the various glands of the body, and separated by them from the blood, and cast off as being of no further use in the animal economy. [SKIN, KIDNEY, etc.]

Exe, a river of Devonshire formed by the junction of two streams flowing from Exmoor, and uniting on the border of Devon. It flows S. past Exeter, and forms an estuary at Exminster. The river is not navigable so far as Exeter.

Execution has several meanings in law:—
(1) *Execution in Civil Process* is issued by a Court of Justice to enforce its judgment, and the Writ of Execution (which is the last stage of a suit) is given to the successful party either to put him in possession of the thing in dispute or to enable him to recover the debt or damages awarded him by such judgment. For this purpose—in the High Court—a writ issues out of the division of the court in which the judgment is recovered, in the name of the sovereign, addressed to the sheriff of the county in which the property is situate or the person against whom the process issued resides, commanding him to give possession of the property or (as the case may be) to levy on the person's goods or tenements for the amount recovered in the action; upon receiving this writ, the sheriff issues his warrant to his officers to carry out the same.

The Writs of Execution are as follow:—(1) The Writ of Capias ad Satisfaciendum (to arrest the body), the use of which writ out of regard to the liberty of the subject has been of recent years very much curtailed. [CAPIAS.] (2) The Writ of Fieri Facias against the goods and chattels. [FIERI FACIAS.] (3) The Writ of Elegit against the lands generally of judgment debtor. [ELEGIT.] (4) The Writ of Habere Facias Possessionem against the particular lands or premises recoverable in the action. (5) In Detinue (which is an action brought for recovery of goods detained) there is a special writ of execution for recovery of the goods themselves, or their value, with damages and costs. By 23 and 24 Vic., c. 38, Writs of Execution on judgments are required to be registered in order to affect lands as against *bonâ fide* purchasers for valuable consideration, and no judgment affects lands until such lands shall have been actually delivered in execution by virtue of a Writ of Elegit or other lawful authority, and such Writ of Execution must be registered.

In the County Courts the process, though different in form, is much the same in effect. When the judge at the hearing adjudges a sum of money to be paid by one party to another by instalments or otherwise, and the order for payment is not complied with, execution may issue against the goods of the judgment debtor, and if such debtor has the means to pay at the date of the judgment, or at any time afterwards, and fails to do so, he may, on his ability being established to the satisfaction of the judge, be committed to prison for any period not exceeding forty days, though he may obtain his liberty at any time by paying the sum ordered. Also the execution upon a judgment of one County Court against the debtor within the district of another County Court in England may be effectuated by such latter Court, provided such latter Court have received and duly sealed with its own seal the warrant duly attested of the first County Court to proceed to such execution. Also if a judge of the High Court is satisfied that the debtor has no goods or chattels convenient to satisfy the judgment obtained in the County Court, he may order a Writ of Certiorari to remove the judgment into the High Court for the purposes of execution against his lands or otherwise. Furthermore, by the "Inferior Courts Judgment Extension Act, 1882," the judgment of a County Court in England

may be executed in any other part of the United Kingdom by the corresponding Court in such other place, provided a certificate of the judgment be first registered in such other corresponding Court.

2. *Execution of Criminals* is another and more painful signification of the word. It is performed by the proper legal officer, the sheriff or his deputy. The Common Law mode of execution is by hanging, which until the year 1868 took place in public; but in that year an Act was passed directing that the execution must take place within the walls of the prison, in presence of the sheriff, gaoler, chaplain, and surgeon of the prison, and such other officers of the prison as the sheriff requires or allows. An Act of Parliament of the present reign provides for suspension of execution in the case of a lunatic.

3. *Execution of a Decree.* Sometimes from the neglect of parties, or some other cause, it becomes impossible to carry a decree of a Court of Justice into execution without the further decree of the Court upon a bill filed for that purpose. This happened generally where parties having neglected to proceed upon the decree, their rights under it became so embarrassed by subsequent events that it was necessary to have the decree of the Court to ascertain and settle them. Such a Bill might also be brought to carry into execution the judgment of an inferior Court of Equity, if the jurisdiction of that Court was not equal to the purpose, as in the case of a decree in Wales which the defendant avoided by going into England.

4. *Execution of Deeds.* [DEEDS.]

5. *Execution of Wills.* [WILLS.]

Executive Government is that part of the sovereign power in a country which carries out the sentence of the judicial authorities, or the resolutions and acts of the legislative power. The Crown and the officers appointed by it for the above purposes form the Executive Government in England.

Executor is one to whom another commits the execution of his last will or testament. The origin of executors appears to be traceable to a constitution of Manuel Commenus. All persons capable of making a will, and some others, as married women and infants, are eligible to be made executors, but infants are incapable of acting in that capacity till they attain full age.

An executor derives his authority from the will alone. If no executor be appointed by the will, administration is granted with the will annexed, and administrator is bound to obey the directions of the will. An executor may decline to act; but, having once acted, he cannot divest himself of the office or its liabilities; nor can an administrator who has accepted the office get rid of his responsibility.

The first business of an executor is to prove the will, which is now done in the Probate, Divorce, and Admiralty Division of the High Court at the principal or one of the District Registries. Formerly this jurisdiction was vested in the Ecclesiastical Courts. [ECCLESIASTICAL COURTS.]

The Court furnishes the executor with a document known as "the Probate" containing an engrossment of the will and copy of the grant of Probate. The original will is deposited in the Registry of the Court, and may be inspected in office hours on payment of a search fee of 1s. An executor may do many acts in execution of the will before Probate, as paying and receiving debts, etc.; but he cannot before Probate sustain actions or suits. An administrator can do nothing till the grant of letters of administration. [ADMINISTRATION.]

If an executor happens to die before grant of Probate, admininstration must be taken out to his testator, with the will annexed; but if an executor die after having probate of will granted to him, his executor will be the executor and representative of the first testator, unless, before proving the will of second testator, he renounces the execution of the will of the first. If the executor should die intestate, his administrator is not the representative of the original testator, but an administrator "*de bonis non*" (that is, of the goods unadministered) of the original testator must be appointed. Should there be several executors, the office survives, and is transmitted ultimately to the executor of the surviving executor, unless he dies intestate. Executors have a joint and entire interest in the effects of their testator; any one of them is capable of acting by himself or herself and the receipt for a debt or the transfer of property by one is as effectual as if made by all.

If a *stranger* acts as executor without authority, he is termed an executor *de son tort* (in his own wrong), and he has all the liabilities of an executor without any advantages. But the only advantage which an executor practically derives from his office is his right to retain any debt due to him from the testator, as against creditors of equal degree to himself.

The duties of executors and administrators are generally the same and comprise the burying of the deceased, the proving of his will (if any), the getting in his goods and chattels to pay his debts in the order appointed by law, and also his legacies, if any, and to distribute the residue of his goods and chattels in the manner directed by the will, or according to the statutes for the distribution of the effects of intestates, in case of there being a total or partial intestacy (q.v.).

In like manner as the rights of a bankrupt pass (with certain exceptions) to the trustee, so upon the death of either of the parties between whom a cause of action founded on contract has arisen, the right of maintaining such action survives in general to or against his executors or administrators. In respect, however, of actions founded on certain violations of personal rights—as, for instance, slander—the maxim is that they *die with the person*, and this formerly extended to every case of tort as distinguished from contract. But (except with reference to causes of action for violation of personal rights, such as assault, slander, and the like) this ancient rule has been now set aside by various Acts of Parliament; for by 4 Edward III., cap. 7, actions may be maintained by executors and administrators for trespasses to the *personal* property of their testator or intestate, and by 3 and 4 William IV., c. 42, sec. 2, for any injury to his real estate provided such injury was committed within six calendar months before and the action is brought within one year after his death,

and by the last-named statute actions may be maintained against executors or administrators for any wrong committed by the deceased to another in respect of property either real or personal, provided the wrong was committed within six calendar months preceding the death and the action be brought within six calendar months after the executors or administrators have taken upon themselves the administration. As to compensation to families of persons killed by accident, *see* "CAMPBELL'S ACT."

Executory and Executed Consideration. The consideration for a contract (like the contract itself), may be either *executed* or *executory*, and its character in this respect is determined by the relation which its performance bears in point of time to the promise as being either prior or subsequent. Thus, if I bail a man's servant, and the master afterwards promises to indemnify me, this is an executed consideration ; but if a man promises to indemnify me in the event of my bailing his servant, the consideration is then executory. And with regard to an executed consideration the rule is, that if it were not at the express or implied precedent request of the promiser, but a mere voluntary contract, it will not suffice to support a promise. Therefore, in the first example, the promise would not be binding in law unless the bailing were at the master's precedent request. [CONTRACT, CONSIDERATION.]

Exegesis is the interpretation of the Scriptures, and at the present day covers the whole field of Biblical criticism, literal and doctrinal.

Exeter, a city, seaport, parliamentary (one member) and municipal borough, capital of Devon, on the left bank of the Exe, about 10 miles N. of the English Channel, and on the Great Western Railway. It is built on the top and sides of a hill sloping down towards the river, which is crossed by a stone bridge at the western entrance of the town, which consists of two main streets at right angles with others branching from them. Much of the town is very ancient, but there are modern terraces and villas, which are daily increasing as the educational advantages of the town make it desirable as a residence. The cathedral is cruciform, and is 408 feet long, with two Norman towers 130 feet high. The choir is 128 feet long, and there are 10 chapels, and a chapter-house. The architecture of the west front is everywhere admired. There is much Norman work in the different churches of the city ; and parts of the old Saxon walls remain, and the ruins of the castle of Rougemont. The free grammar school has 16 exhibitions to Oxford or Cambridge, and there are libraries, museums, a diocesan training college, a hospital, etc. Formerly, Exeter was a seat of the woollen trade, but this industry is now extinct. There are iron-foundries, agricultural implement works, paper-mills, corn-mills, and tanneries, and some manufactures of gloves and lace. There is a basin to which ships of 400 tons have access by means of a canal 5 miles long. The town was an old British station before being the Isca Damnoniorum of the Roman times. Many coins, statues, and fragments of pavement have been discovered. The Saxons called it Monktown for its many ecclesiastical establishments.

Exhibitions (Latin *exhibere*, to shew, display) are public displays, generally of art or industries or productions. Their number and kind are many ; but the most noted are the series of Industrial Exhibitions, inaugurated in England at the instance of the late Prince Consort in 1851 This has been followed by many, in all countries, England, France, America, etc. The French Exhibition of 1889 was in commemoration of the centenary of the Revolution, and was rendered famous by the well-known Eiffel Tower.

Exile, in the ancient Greek states, arose as a means of evading the penalties of homicide implied by the blood feud. Voluntary withdrawal of the offender was legally recognised, and (in the case of wilful murder) involved formal outlawry and confiscation of property. By Solon's laws, political indifference during civil conflict was similarly punished at Athens. [OSTRACISM.] Under the Roman Republic, though there was no formal penalty of exile, the "interdiction of fire and water" (and of certain civil rights which they symbolised) within certain limits of Rome, was practically its equivalent (*Cicero*). Under the emperors it was replaced by "deportation to an island" (usually a very small one, such as Patmos or those near Elba), which involved loss of property and citizenship, but not of freedom. A milder form of exile, "relegation," did not involve these consequences, and either confined the person to certain places, or excluded him from them. Thus Ovid was "relegated" to Tomi. The punishment, as implied in outlawry, has existed under Continental governments, but its most important application at present is in Russia. Here it is a means at once of getting troublesome persons well out of the way, and of colonising remote, wild, and unprotected parts of the empire. So for three centuries the system has flourished and extended with every circumstance of barbarity, corruption, and stupidity. But to-day—thanks partly to the recent tragic events in Kara and Yakutsk, and partly to the investigations of George Kennan, which supplemented and substantially confirmed the statements of native writers like Maximoff and Yadrintseff, and of the revolutionists Stepniak, Krapotkin, and Volkhovsky—it is generally condemned as bad alike for the exiles themselves and the communities amid which they are settled. Since 1823, whence the statistics date, about 800,000 exiles have crossed the Urals ; and during the last fifteen years the annual average has increased to about 17,000. These include all manner of offenders, from the mere vagrant who has lost his passport and the peasant who has offended the village authorities, to the hardened ruffian who would get short shrift were capital punishment in vogue. Of the whole number, little more than half have received even the semblance of a trial, and many of these only after long preliminary detention. The others have been sent on simple "administrative order," a method which became common in the case of political suspects in Alexander II.'s later years. The

journey to Siberia, though much lightened, is still a terrible ordeal, especially for the sick, and for the women and children who are allowed to accompany the prisoners into exile. Twenty years ago the gangs of fettered convicts with their military escort had to tramp the whole distance from Moscow—4,700 to 5,200 miles—a march occupying from two to three and a half years. Now, however, there is rail and water communication as far east as Tomsk, and the journey on foot is reduced by one-half. About 330 miles is made per month, there being a halt for rest every third day. Each prisoner receives five cents a day for food. Most of the forwarding prisons and *étapes* are regularly and scandalously overcrowded, so that typhus, scurvy, typhoid, and syphilis work havoc, and the sick and death rates are almost incredibly high. There is seldom separate accommodation for the sick, and everywhere the degradation of the few gentle and innocent by the many strong and brutal goes on in the foul *cameras* where they are promiscuously herded together. The journey ended, the body of exiles resolves itself into two main classes: the imprisoned or hard-labour convicts, numbering about one-third of the whole number, and those merely banished to a certain area with more or less close surveillance. The first class are sent mainly to the Czar's mines in Trans-Baikalia or Nerchins or to the island of Saghalien, on the Pacific coast; in the last year or two a good deal of convict labour has also been used in the construction of the Siberian railway. The second class, which includes most of the political and religious offenders, are scattered all over the country, and many of them break away at once and join the floating criminal population which swarms along the great roads of Siberia, and which is credited with two-thirds of all the crimes that are committed there. The lot of the "politicals" is never a happy one. They are forbidden to teach, to trade, and "generally to exercise any public activity," and as the Government allowance is only about twelve shillings per month, a bare subsistence is difficult. Many are now sent to the wild Mongolian frontier and to the sub-arctic Yakut country, where they have to live in the filthy *yourts* of the natives. What this means is indicated by the fact that, of 79 politicals in Yakutsk in 1882, Kennan found that six had committed suicide before 1885. Still this may be preferable to the terrors of prison life at Kara or Saghalien. Three special commissions have condemned the exile system, and Mr. Galkin Wrasskoy, the chief of the prison administration, presented a plan for its radical alteration to the Imperial council in 1888. It was rejected, probably on financial grounds; but it is almost certain that a rational prison system would be cheaper in the long run. [KARA, KENNAN, SAGHALIEN, SIBERIA, VOLKHOVSKY.]

Exine, the outer coat or exospore of the pollen-grain (microspore) of flowering plants, formerly known as the extine. Smooth in the pollen of self-pollinating and wind-pollinated flowers, in insect or bird-pollinated ones it is often furnished with spinous (echinulate) or ridge-like projections. In *Pinus* it is produced into two reticulately-marked air-bladders. It is either simply burst or slashed to permit the protrusion of the pollen-tube in germination, or little lid-like portions of it may be pushed off.

Exmoor, a forest occupying part of the S.W. of Somerset and extending into Devon. Part of it is now cultivated, but the greater part is wild heath, marsh, and moss. The surface is varied, and there are some considerable heights, the greatest being Dunkerry Beacon (1,668 feet). Of late some iron mining has been carried on. The Druids seem to have held the spot in esteem. *Lorna Doone* has familiarised most people with the main features of the district, and many tourists search out and visit the Doone valley, the Badgery woods, and the Slide. Whyte Melville has also illustrated the region in *Katterfelto*. Till quite recently a wheeled vehicle was an unusual object there.

Exmouth, a town of Devon, on the left bank of the Exe estuary, 10 miles S.E. of Exeter, situated in a gap of the cliff. It is now a fashionable seaside resort, and has a good sandy beach well suited for bathing. In the time of Edward III. it was a flourishing port. The industries are fishing and lace-making.

Exmouth, VISCOUNT. [PELLEW.]

Exocœtus. [FLYING-FISH.]

Exodus (Gk. *ex*, out, *hodos*, way) is the name given by the Septuagint translators to the 2nd book of the Pentateuch, since it is mainly occupied with the account of the departure of the Israelites from Egypt, with the events that immediately led up to and followed it. The authenticity of the book has been much questioned, and in the matter of arithmetic and of details it has met with considerable adverse criticism.

Exogamy. [MARRIAGE.]

Exogens, a name formerly applied to the class Dicotyledons (q.v.) among angiospermous plants, with which were included the gymnosperms, since they agree in the growth of their stems in thickness being exogenous—that is, in a general sense external, taking place, as it does, through the activity of the cambium (q.v.), which, though under the bark, is external to the wood of the stem.

Exophagy. [CANNIBALISM.]

Exosmose. [ENDOSMOSE, OSMOSE.]

Expansion means increase of dimension in one, two, or three directions. We thus have linear, areal, or voluminal expansion. Heat is a general cause of expansion for most materials, a definite increase in temperature of the substance being associated with a corresponding increase in its dimensions. The term *coefficient of expansion* is hence applied to the proportional increase in dimension of a body per degree rise in temperature. Such expansion by heating must be allowed for in practice, and inasmuch as most solids expand with great force the effect may be rendered useful in many applications. The expansion of an iron girder bridge on a hot day may amount to three or

four inches or more, and provision must therefore be made to render such expansion free. The walls of a building that are in danger of falling outwards may be drawn together by iron bars that are expanded by heating and then allowed to cool and contract; the iron tires of wheels are fixed on when hot, so as to bind the parts of the wheel more tightly together when cold; the expansion by undue heating of metals in close neighbourhood of each other may bring them into actual contact, and by so doing set up an electric circuit and ring an alarm bell [ELECTRIC BELLS]; and many other practical applications of extension by heating might be cited. But indiarubber, and in certain states sundry other materials, do not expand on heating but suffer contraction. [HEAT.]

Expectorants (from two Latin words signifying, out of the chest), drugs which promote the secretion of the mucous membrane of the air passages—*e.g.* ipecacuanha, senega, squills, etc.

Explosion. In pure chemistry the term explosion is given to a change of condition of a chemical system, which, once initiated, is quickly propagated through the system with the evolution of energy, and without the supply of external energy. The term is, however, generally applied to any sudden bursting of a body, usually owing to the rapid generation of large quantities of gas, though in some cases, as in boiler explosions, owing to gradually increasing pressure from the interior. Explosions are usually initiated by a flame or sudden concussion. In the latter case rapid impact of a small mass is more efficacious than that of a more slowly moving larger body. In some cases a particular form of vibration can cause the explosion; thus iodide of nitrogen placed on a vibrating string explodes when a certain rate of vibration is reached. Many substances are dependent on some resistance for their explosion, merely burning quietly if the gases can pass freely away. In such cases the slightest possible resistance, as a sheet of paper, may be sufficient to convert the harmless combustion into a dangerous detonation. Explosions in coal mines have long attracted much attention, but some doubts still exist as to the chief cause. They are usually ascribed to the *marsh gas* (fire-damp) CH_4 in the mine, but it has been shown that the ignition of fine dry coal dust alone is sufficient to cause an explosion, just as flour dust has given rise to explosions in flour mills. The cause of the work done by the explosion of a substance, such as gunpowder, is the very rapid evolution of large quantities of gases, which would occupy in the substance mentioned, under ordinary conditions, about 300 times the space taken up by the powder itself, while owing to the high temperature it has been estimated that the pressure, when the powder entirely fills the space in which it is fixed, rises to 6 or 7 thousand atmospheres. The velocity of explosion—*i.e.* the rate at which the changes are propagated through the system, and its dependence upon the external physical conditions—has been the subject of much experimental work, though owing to its nature it offers great difficulty to accurate experiment.

Explosives. The term is in general applied to such substances, either mixtures or free compounds, which can suddenly, owing to some external impulse, give rise to large volumes of gas. The impulse may be given either by a flame, a sudden concussion, electric spark, or other means. In most cases of ordinary explosives the gases are formed owing to the oxidation of some of the constituents, the explosive itself containing in some of its ingredients the oxygen necessary for the oxidation. The energy of the explosion depends, *inter alia*, upon the rate with which the chemical change can be propagated, and hence, as would be expected, owing to the greater proximity of the molecules, it is generally greater in the case of explosives which are compounds than in those which are mixtures. The oxygen is usually present in the form of a nitrate, chlorate, or in the group NO_2, the latter being especially the case with explosive organic compounds. Some of the principal explosives in ordinary usage are the various varieties of *gunpowder*, *gun-cotton*, *nitro-glycerine*, and *dynamite*, *fulminate of mercury*, and preparations of *picric acid* (such as *melinite*, *lyddite*, etc.); and explosives obtained from these compounds. During late years also attention has been given to experiments upon flameless explosives, more especially for use in coal mine blasting. A common mode is the enclosure of the explosive in a water cartridge, but some substances have been prepared which themselves explode with the production of no flame. As examples there are *Roburite*, *Bellite*, and *Securite*, consisting of mixtures of di-nitro-chlor-benzene or di-nitro-benzene with ammonium or other nitrate. For estimating the strength of an explosive, the following points are the chief to be considered:—(1) the quantity of gas produced; (2) the temperature; (3) the rapidity of evolution. In the case of gunpowder the explosive pressure has been both estimated and measured, with but little difference in the results; but in the case of the stronger explosives it has been hitherto practically impossible to measure their strength. The power of the commoner explosives compared for equal bulk has been computed as follows:—

Nitro-glycerine	100
Dynamite	74
Gun-cotton	60
Blasting powder	17·5

One of the tests often employed is the effect in smashing iron plates when exploded upon their surface. Another is to explode the substance in a small cylinder provided with a form of piston, and measure the compression of a lead plug placed under the piston. Various other methods have been adopted, but none are at all satisfactory. It is unnecessary to state that the manufacture of explosives is one which requires the greatest possible care and precaution, while the sale is regulated by stringent legal acts, etc. [*See* separate articles on the explosives mentioned.]

Exponents, in algebra, are the indices or powers to which various quantities are raised. Thus if a quantity x is to be raised to the seventh power it is written x^7, the 7 being the exponent

The theory of indices shows the general extension of such exponents to fractional and negative values. [INDICES.]

Extension means a drawing out. Geometrically. the extension of a substance is regarded as a strain and the cause is called stress. Such may be produced by the direct application of mechanical force, and this expenditure of energy is measured by the product of the force and the extension produced. Thus in the case of mere elongation or extension in one direction only, the product of force and the change of length measures the work done and, therefore, the energy expended. Similarly for extension in two dimensions, the force per unit length multiplied by the change in area gives the work done ; and for extension in three dimensions the force per unit area multiplied by the change in volume measures the energy expended. In the case of expansion due to heating we are thus able to measure the heat required to effect this expansion, and can conclude that unless the substance is itself changed the heat energy given to it is measured in the above way.

Extine. [EXINE.]

Extortion is an offence in abuse of the administration of justice, and consists in any official unlawfully taking by colour of his office from any man or woman any money or thing of value that is not due to him, or more than is due, or before it is due. The punishment for this offence, which is a misdemeanour, is fine and imprisonment at the discretion of the court, and sometimes a forfeiture of the office. There are also various statutes providing penalties for extortion by sheriffs, under-sheriffs, bailiffs, gaolers, clerks of assize, etc.

Extracrinus, a genus of sea-lilies, or Crinoideæ, to which belong some of the best known English fossil species, usually assigned to *Pentacrinus*.

Extracts. There are several forms of extract in the British Pharmacopœia ; thus the active principle of a drug may be extracted with water, alcohol, ether, or, as in one instance—that of the *extractum colchici aceticum*—with dilute acetic acid.

Extradition. Where a person who has committed a crime in one country quits that country for another, and is delivered up by the latter to the former for the purpose of trial, this is known as extradition. At Common Law there was no jurisdiction of this kind, and to remedy this state of things several Acts of Parliament have been passed. The duty of a state to make extradition of criminals is by no means generally admitted, and it is considered an exercise of comity only ; generally speaking, no state willingly allows an extradition of its own subjects, and no state will decree an extradition of political offenders. The existing procedure of England in regard to the extradition of criminals is regulated by the "Extradition Acts, 1870 and 1873." which provide that when an arrangement for that purpose has been made with any foreign state. Her Majesty may, by Order in Council, direct that the Act shall apply in the case of such foreign state, subject to such conditions as may be expressed in the order. But the former Act (1870) makes an express exception of political offences, the Secretary of State having it in his discretion to decide whether the offence is or is not of a political nature. The Act of 1873 extends provisions of the principal Act to the case of accessories punishable as principals.

Extravasation (from the Latin, escape from a vessel), a pouring out of the contents of a blood-vessel into the surrounding tissues.

Extreme Unction, one of the seven Sacraments of the Catholic Church. It consists in the anointing by the priests of the channels of the five senses, accompanied by prayers that all sins of which they have been the means may be forgiven. The Greek Church makes a more frequent use of it in disease than the Roman Church, which reserves it for cases of mortal sickness. (James v. 14.)

Eyam, a Derbyshire village, 5 miles N. of Bakewell, chiefly made famous on account of the outbreak of the plague there in 1665, and the heroic conduct of the rector, William Mompesson, who devoted himself to his parishioners, two-thirds of whom perished. An interesting *History of the Plague at Eyam* has been published.

Eyck, JAN VAN (d. 1441), also called Van Brugge, a noted Netherland painter. He was taught by his brother, whom he soon outstripped. The family dwelt chiefly at Bruges, but in 1420 he. with his brother Hubert and sister Margaret (also a painter), went to Ghent to paint for the cathedral there a picture of the *Adoration of the Lamb*. This was on wood, with side panels, and contained 300 figures. Jan was also court painter to Philip the Good of Burgundy, and utilised his court surroundings for filling in the details of his pictures. His brother and sister both died before the picture was finished, in 1432, after which he returned to Bruges, and remained there till his death. He was one of the encouragers of oil painting, and was very successful as a painter on glass, and did much to introduce perspective into painting. His faces, colouring, and grouping are good, but the deficient anatomical training of the day is visible in the extremities. Among his pupils are said to have been Albert Dürer, Hans Memling, and Holbein.

Eye. *Anatomy of the eyeball.* The eyeball is nearly spherical. Its outer coat is, excepting the transparent anterior portion (*cornea*), known as the *sclerotic* (from a Greek word signifying "hardness"). the sclerotic being composed of dense connective tissue. Into this coat the muscles which effect the movements of the eyeball are inserted ; they are six in number ; four pursue a straight course, and are known as the (*recti*), superior, inferior, external, and internal ; the two remaining muscles are the superior and inferior oblique muscles. Covering the anterior portion of the sclerotic, and reflected over the inner surface of the eyelid, is the *conjunctiva* (q.v.). The posterior portion of the hollow of the skull in which the eyeball is situated (*orbit*) contains fatty tissue which serves as a packing material for the eyeball. Piercing the bony wall

of the back of the *orbit* and inserted into the posterior portion of the eyeball is the *optic nerve*.

The various coats of which the eyeball is composed are seen on reference to the annexed figure. The outer protecting coats, *sclerotic* and *cornea*, have been already alluded to. Within these are

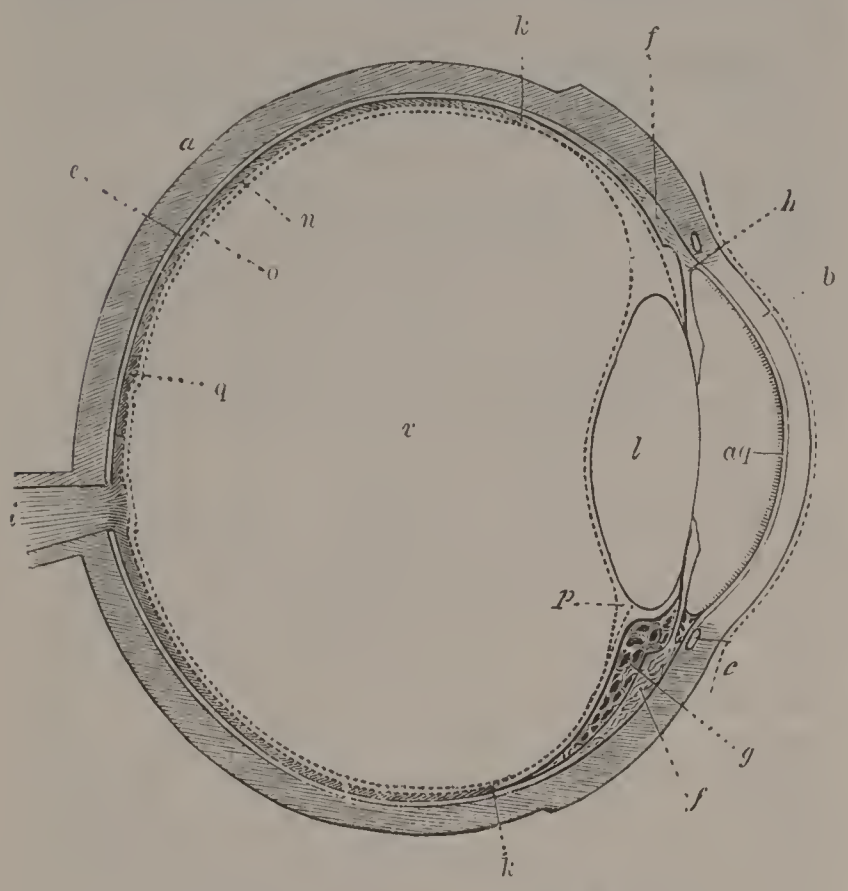


Fig. 1.—SECTION OF THE HUMAN EYE.

a, Sclerotic coat; *b*, cornea; *c*, conjunctiva; *e*, choroid coat; *f*, ciliary muscle; *g*, ciliary processes; *h*, iris; *i*, optic nerve; *k*, boundary of retina; *l*, crystalline lens; *n*, choroid pigment; *o*, retina; *q*, yellow spot of retina; *aq*, aqueous humour; *r*, vitreous humour.

found, first the middle coat, comprising the choroid, iris, and ciliary processes, and innermost of all lies the *retina*. Further, it is seen that within the globe of the eye there lie three transparent media—(1) the *aqueous humour*, occupying the *anterior chamber*; (2) the *crystalline lens*, and (3) the *vitreous humour*. The aperture in the *iris* seen through the transparent *cornea* is known as the pupil of the eye. The *iris* being composed of muscular fibres, the size of the pupil varies with the state of contraction and relaxation of these fibres. Under the stimulus of light the pupil becomes small, while on entering a dark room it undergoes dilatation. The portion of the eye which is immediately concerned with the translation of the undulations of light waves into the phenomena of vision is the *retina*. The structure of this membrane is exceedingly complex. Suffice it to say that the portion of the retina which the waves of light are supposed to directly influence is the *rod and cone* layer, seen at the upper portion of the figure, and that these *rods and cones* are supposed to be in direct connection with the terminal fibres of the *optic nerve*, and that through these fibres they communicate the disturbance caused by the action of light upon them to the brain. The said *optic nerve*, after piercing the several coats at the back of the eye, radiates outwards, forming an expansion, lining the entire inner surface of the *retina*. In the figure these fibres are represented by the transverse lines depicted at its lower portion.

The eyelids are two folds composed of skin externally, conjunctiva internally, while between these is a supporting framework of cartilage, the *tarsal cartilage*, and a series of muscular fibres. Closure of the eyelids is effected by the contraction of a muscle, the *orbicularis palpebrarum*, which surrounds them, while the upper eyelid is raised by the contraction of another muscle, the *levator palpebræ*, which is inserted into the *tarsal* cartilage.

In the upper and outer part of the *orbit* is situated the lachrymal gland, the secretion of which is poured out through a number of minute

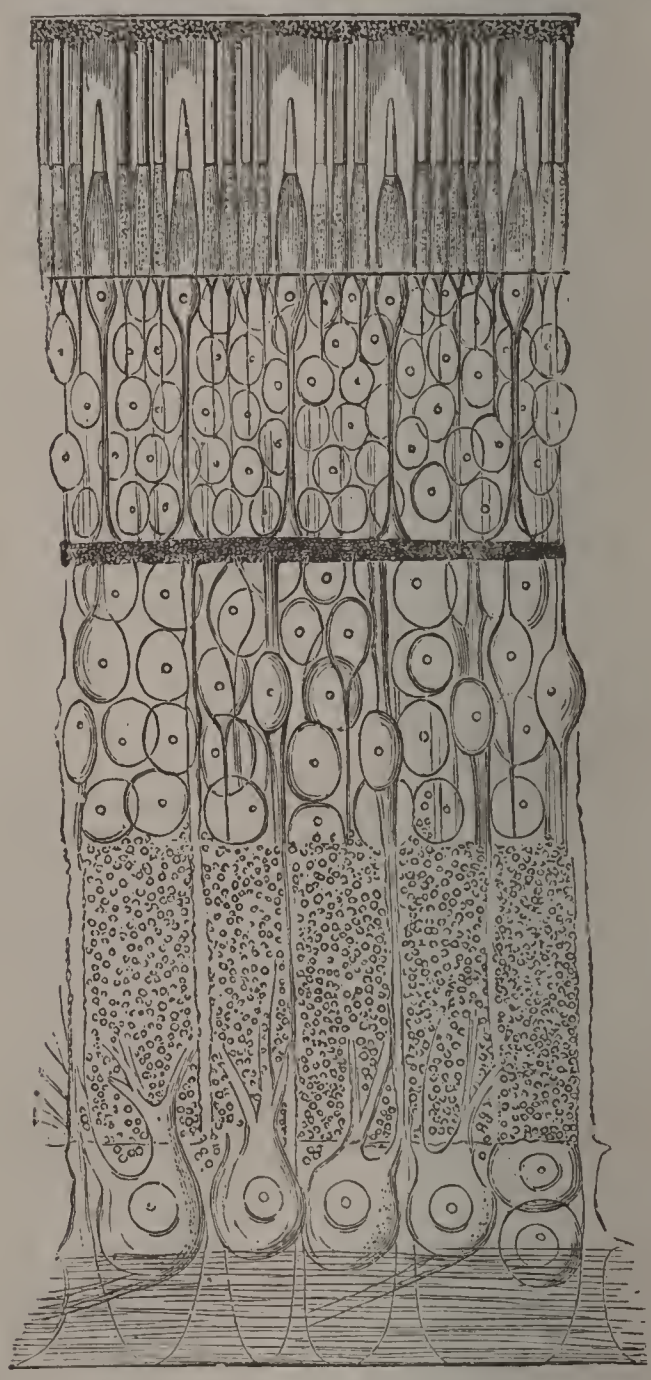


Fig. 2.—SECTION OF THE HUMAN RETINA (SEMI-DIAGRAMMATIC, SEEN UNDER A HIGH MAGNIFYING POWER).

ducts, washes over the anterior surface of the eyeball, and escapes at the inner angle of the eye by two minute openings, the *puncta lachrymalia*, which open into two canals, the *lachrymal canals*, which in turn open into the *lachrymal duct*, by means of which the tears are carried downwards into the nasal cavity. The motor nerves of the external muscles of the eyeball are the third, fourth,

and sixth cranial nerves. The fourth nerve supplies the superior oblique muscle, the sixth nerve the external rectus muscle, and all the remaining external muscles of the eyeball are supplied by the third nerve.

The internal muscles of the eyeball are, firstly, the muscles of the *iris*, which are supplied by a branch of the third nerve and by the sympathetic, and secondly, the *ciliary muscle*. It is this last-named muscle which is concerned in the *accommodation* of the eye for seeing near objects. The muscle arises anteriorly from the junction of the cornea and sclerotic, and passes backwards to be inserted into the choroid. It should be mentioned that the lens is maintained in its position by a suspensory ligament, which is attached to the anterior portion of the choroid. When the ciliary muscle contracts, the choroid in the neighbourhood of the point of attachment of the lens is drawn forwards, the suspensory ligament is relaxed, the tension which it exercises on the elastic lens diminishes, and the latter bulges forwards. The refractive power of the lens is thereby increased. The rays of light from distant objects are, of course, parallel, and the normal eye is so adapted that they are exactly focussed on the *retina*. It follows, then, that the divergent rays which proceed from near objects would, unless some change in the refracting mechanism of the eye occurred, be focussed behind the *retina*. The altered convexity of the anterior surface of the lens, brought about by the relaxation of the suspensory ligament above alluded to, increases the refracting power of the eye and brings the divergent rays to a focus upon the *retina*. This is the way in which the *accommodation* of the eye for near objects is brought about.

To return to the *retina*, it should be noted that a small portion of that membrane only is concerned in the formation of distinct images of external objects. This spot is the *yellow spot* or *fovea centralis*, and in order that the said images may be accurately focussed upon the *yellow spot* in each eye, it is necessary that the eye should be so directed by the muscles as to bring this about. Hence the convergence of the eyes when looking at a near object. Another part of the retina which demands attention is the point

Fig. 3, A.

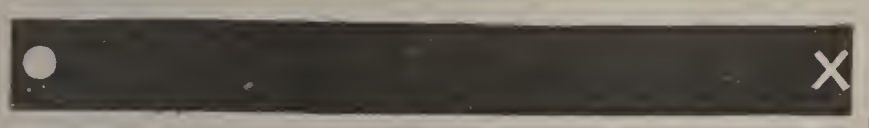


Fig. 3, B.

of entrance of the *optic nerve*. At this spot the *rods* and *cones* are completely absent, and this part of the retina does not transmit to the brain any image which may be thrown upon it; it is therefore called the *blind spot*. The existence of this *blind spot* can be readily verified by reference to the annexed figure; thus, for the right eye, close the left eye and hold the right some 10 or 12 inches above the cross in Fig. 3, A, and steadily regard the same. The white circle will then be found to be invisible; on approaching a little nearer to the figure, or again on receding from it, the circle will be seen to come into view. The invisibility of the circle when the head is held at the appropriate distance is due to the fact that its image falls upon the *blind spot* of the *retina*. By proceeding in a similar manner with Fig. 3, B, the same phenomenon can be demonstrated in the case of the left eye.

Diseases and injuries of the eye. For diseases of the conjunctiva, cornea, iris, and retina, see special articles, CONJUNCTIVITIS, KERATITIS, IRITIS, and RETINITIS. The chief disease of the lens is cataract (q.v.); glaucoma is also dealt with under a special head. [For the subject of squint, *see* STRABISMUS.]

It remains to discuss sympathetic ophthalmia errors of refraction, injuries of the eye, and diseases of the eyelids and lachrymal apparatus.

Sympathetic ophthalmia is a term applied to inflammation affecting an eye occurring consecutively to injury of the other eye. It is only certain forms of injury which are apt to be followed by sympathetic affection of the uninjured eye. Punctured wounds, especially when they involve the "ciliary region" (that is, the portion of the sclerotic immediately outside the cornea, and lying over the site of attachment of the ciliary processes), are particularly dangerous in this respect. In cases where an injury of this kind has occurred the question arises whether it is not advisable to remove the damaged eye. Where the injury has produced considerable loss of vision it is generally considered to be necessary to effect this removal without delay. If, however, the puncture has been a clean one and but little loss of vision has resulted, an attempt is sometimes made to preserve the injured eye, but such cases need the most careful watching and are always cause for much anxiety. The onset of *sympathetic ophthalmia* is so insidious as to elude the observation of any but the most careful observer. The earliest symptoms of the disease are watering of the eye, avoidance of light, and slight loss of vision. These slight evidences of inflammatory mischief gradually become more and more marked, and result in destructive inflammation of the iris and ciliary processes, leading, it may be, to complete loss of sight.

Errors of refraction. Certain structural defects in the eye interfering with the focussing of images upon the retina must be considered under this head. It should be premised that the arrangement which obtains in the normal eye is such that the parallel rays which proceed from distant objects are (when the ciliary muscles are not in action) accurately focussed on the retina; while the divergent rays from near objects are brought to a focus on the retina by the contraction of the ciliary muscle (accommodation). Such an eye is called an *emmetropic eye*. Two deviations from this normal condition must now be alluded to. In the *hypermetropic* (or *long-sighted*) *eye* the parallel rays from distant objects are brought to a focus (when the accommodation is at rest) behind the retina, so that, for accurate vision, the ciliary muscle must be already brought into play to a certain extent

even for distant objects. A still further effort on the part of the ciliary muscle is called for when such an eye has to deal with the divergent rays from near objects. In the *myopic* (or *short-sighted*) *eye* parallel rays are focussed in front of the retina, and as a consequence no clear image of them can be obtained. Rays of a certain degree of divergence are focussed exactly upon the retina, and in the case of still more divergent rays some slight effort at accommodation becomes necessary for accurate definition. The excessive use of the ciliary muscle in hypermetropia (long-sight) causes it to become hypertrophied, and the muscular strain gives rise to certain symptoms. Of these headache is one of the most prominent, slight catarrhal affections of the conjunctiva are also common in the subjects of hypermetropia; and, again, this condition if allowed to continue unrelieved sometimes produces convergent squint. This last-named phenomenon is explained by the fact that accommodation and convergence are naturally associated with one another in looking at near objects, and if the accommodation be unduly exercised a corresponding abnormal exercise of the muscles which produce convergence is the consequence. Hence the importance of dealing with hypermetropia from the outset. The strain upon the ciliary muscle is obviated by the use of convex glasses of suitable strength. The lenses used should be of such power, that with relaxed accommodation parallel rays are brought to a focus upon the retina. The selection of the proper glasses is a matter demanding considerable care, and the patient's own notions as to what glass suits him should by no means be trusted. Indeed, it is sometimes a matter of difficulty to persuade the subject of hypermetropia that he requires to use any glasses at all. In young children the condition is very apt to be overlooked altogether until some serious complication, such as squint, developes.

In myopia (short sight), on the other hand, the inability to see distant objects generally causes the nature of the mischief to be sufficiently obvious. Here concave glasses must be used in order to focus parallel rays upon the retina. Myopia usually declares itself in growing children, and unless remedied proceeds from bad to worse, sometimes with considerable rapidity. In the more serious cases of progressive myopia, inflammatory mischief in the choroid coat of the eye is apt to supervene.

Astigmatism is the condition in which the refracting media are not equally powerful for rays in different meridians; thus, for instance, rays in a vertical plane may be brought more quickly to a focus by an astigmatic eye than rays in an horizontal plane, or *vice versâ*. In such a condition a luminous spot is not seen as a circle, but as an oval; one set of lines may be seen clearly, but another set, at right angles, appears blurred. This condition must be remedied by the use of cylindrical glasses.

Presbyopia is an affection of advancing years, and is due to a gradual failure of accommodating power, due, it is said, to diminishing elasticity of the lens substance. In presbyopia distant vision is not in any way impaired, but for the distinct focussing of near objects convex glasses require to be employed. The ordinary history of a case is that when the age of 45 or 50 is attained a difficulty is experienced in reading, sewing, and the like. A lens of slight convexity at once obviates this difficulty, but as age advances stronger and stronger glasses have to be employed.

Injuries of the eye. The intense irritation caused by the presence of a foreign body beneath the eyelid is a familiar experience to all. Such intruding substances are particularly apt to lodge beneath the upper lid. Sometimes the simple expedient of raising the lid by holding the eyelashes between the finger and thumb, and then drawing the upper lid down over the lower lid, suffices to dislodge the particle which is the cause of the trouble. In other instances it is only when the upper lid is everted that the foreign body can be detected and removed. The lodgment of particles on the surface of the cornea may necessitate the use of an instrument (corneal spud) for their removal. The operation is much facilitated by benumbing the sensation of the cornea by the use of cocaine.

The dangers associated with penetrating wounds have already been discussed.

Diseases of the eyelids. A *stye* is a small boil affecting the edge of the lid. It usually points to an impaired general condition of health, and in such a state one stye is apt to succeed another, and the trouble is at times very obstinate and intractable. Warm fomentations, poultices, and measures directed with a view to improving the health of the patient are indicated.

Tarsal cysts and meibomian cysts are due to obstruction at the orifice of one of the Meibomian glands of the eyelid. Secretion accumulates and produces an unsightly localised swelling in the lid, for the effectual removal of which it is necessary to make a small incision on the inner surface of the lid, and through this incision to scrape out the contents of the cyst.

Blepharitis is an inflammatory affection of the margins of the lids which is not uncommon in children. Attention to cleanliness, the application of yellow oxide of mercury ointment, and the administration of tonics, speedily effect a cure.

For ectropion and entropion see special articles.

Diseases of the lachrymal apparatus. Obstruction in the passages which convey the tears from the surface of the eye into the nasal cavity causes the lachrymal secretion to flow over the face (watering of the eye, *epiphora*). The condition is generally relieved by the performance of the small operation known as slitting up the canaliculus. Obstruction in the nasal duct or lachrymal sac should on no account be neglected, as it may lead to the formation of a lachrymal abcess. If this should be the case the matter will require to be evacuated, and much pain and annoyance are associated with such a condition.

Eyeglass. [SPECTACLES, OPTICS.]

Eyepiece. [TELESCOPE, MICROSCOPE.]

Eyo (IJU), the dominant people on the Nun branch of the Niger delta, Gulf of Guinea; their territory extends west to Yorubaland, east to the

Old Calabar river, and north to the Benin country, and their chief tribal divisions are the *Akassa* at the mouth of the Nun; the *Nempé* of Brass about the New Calabar river; and the *Okrika* of Bonny still farther west. The Nempé are the most active and powerful of these negro peoples, and their dialect has become the standard form of Eyo speech. It has been reduced to writing by the English missionaries, and now possesses an extensive religious literature; but most of the tribes are still nature worshippers, and even the nominal Christians continue to practise pagan rites. Amongst the local gods are monkeys, the shark (New Calabar), and the iguana (Bonny estuary). The "Jew-Jew men," or magicians, also retain much of their former influence as medicine men, priests, soothsayers, and judges. The ordeal by poison prevails, the *esscré*, or Calabar bean (*Physostigma venenosum*), being much employed for this purpose. It was thus that the Europeans became acquainted with the potent properties of this plant, which is now found to be efficacious in the treatment of ophthalmia. All the Eyo tribes are keen traders, and the "Bonny men" especially enjoy a well-earned reputation for their shrewd business habits.

Eyre, Edward John (b. 1815), was born in Yorkshire. Emigrating young to Australia, he became a squatter and magistrate, and in 1841 headed an exploration of Central and Southern Australia. He was afterwards Governor of New Zealand, and was appointed Governor of Jamaica in 1862, and in 1865 he was attacked, recalled, and prosecuted, John Stuart Mill joining in the action. His opponents could not make out their case, and he was paid the costs of his defence, but he was not further employed by the country.

Ezekiel, the third of the Hebrew greater prophets, was a priest, son of Buzi, and was one of those carried away to Babylon in 599 B.C. By the river Chebar inspiration came to him to speak and reveal to the people the sufferings that came for their idolatry, and to announce to them a future end of their captivity, a return and restoration of prosperity, and a union of Israel and Judah. He also denounced the neighbouring nations. His words are vigorous and poetical, but their full sense is veiled.

Ezra, a Hebrew scribe and priest, descended from Aaron, high priest of the Jewish captives in Babylon, and the guide and ruler of the second expedition of return from Babylon to Palestine. He was looked on in some sort as a second Moses, since he refounded the nation and settled the canon of the Scriptures. He is said to have introduced the square Hebrew character, and to have been the author of the Books of Chronicles, Ezra, Nehemiah, and Esther.

F

F, the sixth letter of the English as of the Chalcidian and Latin alphabets [Alphabet] is derived from the Phœnician *Vau*, which probably is taken from an Egyptian hieroglyph representing the horned asp or cerastes. It appeared in Greek as the digamma, which, however, was soon lost in most Greek alphabets, and occurs only in early inscriptions, and as the numeral for 6. The Roman F had probably the English sound, whereas the Greek digamma was probably a W or intermediate between that and V. In Anglo-Saxon and in Welsh F has the sound of V, the modern F sound being represented by ff.

Faber, The Rev. George Stanley, born near Bradford, Yorkshire, in 1773, graduated at University College, Oxford, and, taking holy orders, became Prebendary of Salisbury and master of Sherborn hospital, Durham, in 1831. He was the author of several learned and pious works, now out of date, such as *Horæ Mosaicæ*, *The Mysteries of the Cabyri*, *The Difficulties of Infidelity*, and *The Difficulties of Romanism*. He died in 1854.

Faber, The Rev. Frederick William, often called "Father Faber," a nephew of the foregoing, was born at Calverley in 1814, and educated at Harrow and Balliol College, Oxford, winning the Newdigate Prize in 1836. After holding a fellowship at University College and the living of Elton, Hants, until 1845, he joined the Church of Rome under Newman's influence. He spent some years in Birmingham, but in 1849 established the Oratory in London, where he ministered until his death in 1863. His hymns, the best of which are *The Pilgrims of the Night* and *The Land beyond the Sea*, have made his name famous in all the churches.

Faber, John, "the Hammer of Heretics," was born in Suabia about 1475, entered the Dominican order, distinguished himself by his zealous opposition to Luther, became confessor to Ferdinand I., and Bishop of Vienna, where he died in 1541.

Fabians, or Fabian Society, a Socialist organisation, started in London in 1883, in order to spread information tending to the abolition of private property in land and of capital vested in other hands than those of the community. Branch societies have been established in provincial towns, in several British colonies, and in New York. The name is presumably derived from the advocacy of a "Fabian policy" [Fabius, Q. M. V.]—*i.e.* they hope that capitalism will wear itself out, and that circumstances will inevitably bring about the "socialisation of industry." The work of revolutionising public opinion is carried on by means of lectures and publications, such as *Fabian Essays* and *Fabian Tracts*.

Fabius, the gentile name of one of the most illustrious patrician families of ancient Rome, was supposed to be derived from *faba*, a bean. According to legend, the whole kith and kin, with the exception of one lad, was destroyed by an ambush near Cremera in the war against the Veii (477 B.C.). From this youth sprang the historical Fabii, who were divided into eight branches, the Ambusti and Maximi being the most important.

Fabius, Quintus (Maximus Rullianus), attacked the Samnites in 323 B.C., contrary to the

orders of the Dictator Papirius, and won a victory. The dictator would have put him to death, but the soldiers interceded. This Fabius held the consulship five times, and was twice dictator.

Fabius, QUINTUS (MAXIMUS VERRUCOSUS), surnamed "Cunctator," great-great-grandson of the foregoing, and the most illustrious of his race, became consul in 233 B.C., when he triumphed over the Ligurians. After the capture of Saguntum he was at the head of the memorable embassy to Carthage. In 217, when the Carthaginian victory at Thrasymene jeopardised the existence of Rome, he was named dictator or (according to one reading in Livy) prodictator, and by his temporising strategy wore out at last the vigour of Hannibal till the re-conquest of Tarentum turned the tide of war. After five consulships he handed over his power to a worthy successor, Scipio Africanus, and died in 203 B.C., having nearly attained his hundredth year.

Fable, a story with a didactic purpose, in which animals, plants, or inanimate objects behave as human beings. On the whole, it differs from a parable in that its significance is moral not spiritual; and from the allegory, in that the moral lesson it teaches is given as a corollary rather than intermingled with the story. The fable, moreover, is essentially short and pithy, and the "moral" can be expressed in a single sentence. Beast fables (q.v.) illustrating some simple moral proposition occur among most primitive peoples, and are the product of a time when animals were commonly credited with such human attributes as intelligence and the power of speech. But (though it is difficult to draw a precise line), it may be said that the fable is generally a pure invention with a didactic purpose; the myth (q.v.) a growth, believed in as truth. The fables best known in Europe probably originated in Hindustan, and were introduced into Europe through Greece. Æsop, to whose invention most of those current in Greece were ascribed, lived, according to Herodotus, in the 6th century B.C., but, though accounts of his life exist, they are probably mere inventions. Metrical versions of fables—the invention of the plots of which was attributed to him—existed in Greece under the name of Babrius (q.v.), and in Latin under that of Phædrus (q.v.). They have come down to us under his name in prose. Lessing has eulogised the short and pithy style of Æsop, but it is probable that this is due to their having been turned from verse into concise and rather bald prose, to serve as a first reading-book for children. There are a few original Roman fables, but as a rule the fables of Æsop, Phædrus, the Sanskrit Hitopadesa, and the early mediæval writers indicate a community of origin. Some of the latter are probably due to the Crusaders. When the fable was taken up as literature, numerous fables were written, sometimes in conscious imitation of Æsop, in Germany and France, and in our own day in Russia. The names of La Fontaine and Kriloff will at once suggest themselves, and there were many German fabulists in the 17th and 18th centuries. Lessing, attacking these fabulists for deserting the simple directness of Æsop in favour of a flowery style, wrote a series of fables (in which the moral is left to inference) as concise as those ascribed to Æsop, and an essay on the fable, in which he argues that a fable differs from a simile or illustration in being the story of a concrete case, from which, however, a general moral can be inferred. He insisted that the fable should be moral, not merely satirical, in its significance. He also discussed the reason why animals are the usual personages in fables. Partly, he concluded, it is because they have definite and well-marked characteristics; partly because our attention is not diverted from the moral by human sympathies as it would be were the characters living beings. This view doubtless attributes too much deliberate invention to the earliest fabulists; and moral conclusions are now mostly so trite that it may be doubted whether any attempt to enforce them by stories such as Lessing's can be very successful. Possibly political satire may again employ the fable, but for its use in moral teaching the time has passed

Fabliaux (Latin *fabula*, story), in French literature, short satirical tales in verse, almost always in octosyllabic couplets, usually satirising classes, *e.g.* women, knights, or monks, often with great licence of expression. They were mostly composed between 1150 and 1350, and were part of the stock-in-trade of the wandering minstrels. Some were derived from classical sources, some from the East through the Crusaders, some probably indigenous. They were the source of most of the Italian prose tales of the 14th or 15th centuries, and Chaucer's *Canterbury Tales* have been termed perfect fabliaux.

Fabricius, CAIUS LUSCINUS, one of the types of early Roman statesmanship and morality, rose to the consulship in 282 B.C. Two years later when Pyrrhus was encamped before Tarentum, he was sent to him as an envoy, and resisted all the corrupt offers of the king, whose esteem he further won by denouncing the proposition of the royal physician to poison his master. He defeated the league of Samnites, Lucani, and Bruttii, that had joined Epirus against Rome. His frugality was so great that at his death he left nothing to pay for his funeral or provide for his daughters, and during his censorship he excluded Rufinus from the senate because he possessed 10 lbs. weight of silver.

Fabricius, or FABRIZIO, GIROLAMO, called "Aquapendente" from his birthplace, was born in 1537, and became a famous professor of anatomy in the university of Padua, where Harvey was his pupil. His discovery of the valves of the veins led to the latter's theory of the circulation of the blood. He died in 1619.

Facade (Ital. *facciata*, from *faccia*, face), the front of a building, usually of one with some pretensions.

Facciolati, JACOPO, was born at Torrigia, near Padua, in 1682. He was trained for the priesthood, and became director of the Paduan seminary, but his chief bent was towards classical philology. He re-edited the *Lexicon* of Schrevelius and the *Ciceronian Dictionary* of Nizolius, and with the help of Forcellini brought out the *Calepino*, a

vocabulary of seven languages. His monumental work, *Totius Latinatis Lexicon*, was completed by Forcellini after his death. He was for some forty years Professor of Logic in the university of Padua, where he died in his 88th year.

Facial Palsy (Bell's Palsy). This is one of the commonest forms of local paralysis affecting a special motor nerve, viz. the seventh cranial nerve, or facial nerve. The following are the symptoms of the affection:—The muscles of the face on the paralysed side cannot be put in action by an effort of the will, and, moreover, they no longer present the condition of tonic contraction which is natural to them in the normal state apart from their being specially called into play. Thus the natural lines of expression are lost, the naso-labial groove is obliterated, the mouth is drawn upwards on the unaffected side, and the furrows on the forehead are less marked on the paralysed side. The condition of things becomes plainly manifest when the patient attempts to laugh, to close his eyes, to frown, and the like. Bell's palsy may be due to disease of the facial nerve, originating in any part of its course. It is most commonly produced by exposure to cold, or it may arise as a complication of ear disease (the nerve in its course through the temporal bone being specially exposed to involvement where aural mischief is present). Treatment consists in the application of the electrical current. [Electricity, Medical.]

Factor, in mathematics, means any number which will divide into another without remainder. The number 36 may be produced by the multiplication of 3 and 12; 3 and 12 are said to be factors of 36; so also 9 and 4 are factors of the same number. In fact, any number that will divide exactly into 36 is a factor of 36. There are numbers that are divisible only by unity, such as 7, 11, 13, 17, 19, 23, and so on. Such are termed *prime* numbers.

Factory Acts. The word factory, according to the original Factory Act (7 Vic., c. 15), means all buildings wherein steam, water, or other mechanical power is used to work any machinery employed in the manufacture of cotton, wool, hair, silk, flax, hemp, jute, or tow.

The Legislature has interfered to prevent children in factories being tasked beyond their strength to the permanent injury of their constitutions. This abuse was the more to be dreaded because a large number of the children engaged in cotton-spinning were not directly employed by the masters, but were under the control of the spinners, a highly-paid class of workmen, whose earnings depended greatly upon the length of time during which they could keep their young assistants at work.

As early as the year 1832 a parliamentary committee sat for the investigation of this subject, and subsequently a commission was issued by the Crown for ascertaining by examination at the factories themselves the nature and extent of the abuses which prevailed, and for suggesting the proper remedies.

The following is a short enumeration of the important recent Acts of Parliament which have been passed, and under which factories are now regulated and controlled, and their several objects. The "Factory and Workshop Act, 1878," contains 107 sections and 6 schedules, and consolidates, with a few amendments, the seventeen preceding Acts, commencing with that known as "Addington's Act," passed in the 42nd year of the reign of George III., up to the 37th and 38th Victoria (the "Factory Act, 1874"). By these several statutes the labour of women, young persons, and children has from time to time been regulated, the education of children indirectly obtained, and the fencing of machinery prescribed. This Act was amended as to white-lead factories and bakehouses by the "Factory and Workshop Act, 1883," and generally by the "Factory and Workshop Act, 1891." By the latter Act the powers of factory inspectors are increased, means of escape from fire are directed to be provided, and the employment of children under eleven years of age, and of women within four weeks after childbirth, is prohibited. Moreover, by section 24 weavers in the cotton, worsted, or woollen, or linen, or jute trade, if paid by the piece, are entitled to have supplied to them with their work "sufficient particulars to enable them to ascertain the rate of wages at which they are entitled to be paid."

The use of steam whistles for summoning or dismissing factory hands requires the sanction of local authorities by 35 and 36 Vic., c. 61.

Faculæ are bright streaks visible on the surface of the sun. They are more obvious near the edge of the disc, the photosphere showing up less brilliantly. Faculæ are simply heaped up masses of the luminous matter forming the photosphere, and may be sometimes recognised as such when passing round the edge of the sun's disc. They are generally abundant in the neighbourhood of sun-spots. [Sun.]

Faculties, Court of. A *Faculty* is a privilege or special dispensation granted to anyone by favour and indulgence, authorising him to do that which by strict law he could not do—for example, to marry without the previous publication of banns; to hold two or more ecclesiastical livings at the same time, and the like. A faculty is very frequently required and granted for special alteration in the church or churchyard (sec. 32 and 33 Vic., c. 94). *The Court of Faculties* is a jurisdiction or tribunal belonging to the archbishop. It does not hold pleas in any suits, but creates rights to pews, monuments, and particular places and modes of burial. It has also various powers in granting such licences as are above referred to.

Fadel (properly Uled-Fedâla), a historic Berber tribe of Algeria, province of Constantine, south-west of Batna; occupies the wooded slopes of the Aures mountains, where rises the Wed-Fedâla, an affluent of the Biskra named from this tribe. The Fadels are mentioned by El-Bekri (11th century), and were formerly very powerful, but are now reduced to less than 2,000 souls.

Fæces, the excrementitious matters discharged by animals from the lower bowel. The average amount of fæces eliminated by the human adult in the course of twenty-four hours is six or eight

ounces. The composition of the fæces is about three parts of water and one part of solids. The latter consist of the more insoluble parts of the food which have resisted the action of the digestive juices (*e.g.* particles of cartilage, woody tissue, muscular fibre, etc.); of mucus and epithelial scales; of mineral salts; of various substances derived from the bile; and of certain specially named constituents (excretin, stercorin, etc.).

Faed, THOMAS, the son of an engineer, was born at Burley Mill, Kirkcudbright, in 1826. As a child he showed an aptitude for painting, and in 1841 was able to begin a course of study in Edinburgh, where he exhibited successfully many charming pictures in water-colours and oil, chiefly illustrative of Scottish life and manners. In 1852 he settled in London, being then an associate of the Royal Scottish Academy, and in 1864 he became a Royal Academician. Among his many numerous and popular works may be mentioned *The Motherless Bairn*, *Home and the Homeless*, *Walter Scott and his Friends at Abbotsford*, *The First Break in the Family*, *The Last of the Clan*, and *The Shepherd's Wife*. His elder brother, Mr. JOHN FAED, is an artist of great merit in the same line, and his *Cotter's Saturday Night*, *Soldier's Return*, *Stirrup Cup*, *John Anderson, My Jo'*, and *Gamekeeper's Daughter*, hardly fall short of the standard attained by his younger kinsman.

Faenza (ancient *Faventia*), a town of Italy, 20 miles S.W. of Ravenna. It is said to have given the name "faience" to the glazed and ornamented earthenware that was first made there about the close of the 13th century, but it is a curious coincidence that Fayence in France was very early the seat of the same industry. The town possesses a citadel, a cathedral, and several interesting churches. It is the birthplace of Torricelli, the physicist.

Fagging, a custom prevalent at some of the older English public schools, including Eton, Harrow, Westminster, Rugby, and Winchester. Boys below a certain form or class in the school are obliged to perform in rotation for the upper boys such offices as cooking their breakfasts, cleaning their studies, running errands, or long-stopping at cricket. Possibly originating in the rule of the strongest (though scholars also to some extent were at the beck and call of the fellows in the earliest Oxford colleges), the practice, though very carefully regulated, is maintained from a regard to tradition, and even defended as a useful discipline. It is not, however, imitated at the newer schools.

Fahrenheit, GABRIEL DANIEL, was born at Dantzic in 1686. He devoted himself to physical researches, and by substituting mercury for spirit in the thermometer, as well as by basing a new scale upon carefully conducted experiments, he rendered a great service to science. Fahrenheit was elected fellow of the Royal Society in 1724, and his scale has generally been adopted in England. His death took place in 1736.

Fahrenheit Scale of temperature, the scale generally adopted in England, is that which was introduced in 1714 by Fahrenheit. The temperature of melting ice is called 32°, and that of water boiling at ordinary pressure is called 212°, there being a range of 180° between these two fixed points on the scale. The temperature of 0° Fahr. is approximately that of a mixture of pounded ice and salt, and was so chosen because that was the greatest intensity of cold then known. The Centigrade scale has certain advantages, and has partially superseded the Fahrenheit. [HEAT, TEMPERATURE.]

Faidherbe, LOUIS LÉON CÉSAR, born at Lille in 1818, entered the French engineers, and served with distinction in Algeria, Guadeloupe, and Senegal, of which latter colony he was governor from 1854 to 1870. The Provisional Government recalled him after the fall of the Empire to take command of the Army of the North in its gallant but futile struggle against the German invader. He won a victory over Manteuffel at Bapaume towards the close of the year, but early in 1871 sustained a crushing defeat at St. Quentin. When peace ensued he was sent on a mission of a nominally scientific character to Egypt and the Soudan. *Le Soudan Français* was the result of this expedition, and several other works of interest on the languages, antiquities, and natural features of North Africa have come from his pen, besides an account of his campaign in France. He died in September, 1889.

Fainéants, ROIS (from Fr. *faire néant*, do nothing), a term applied to the effete Merovingian (q.v.) kings, who abandoned their authority to their mayors of the palace.

Fainting, and SYNCOPE, are terms applied to the condition produced by a sudden disturbance of the heart's action or of the distribution of the blood within the body, resulting in a diminished supply of blood to the brain and other parts. The symptoms of syncope are pallor of the skin, especially noticeable in the face, often accompanied by sweating and associated with coldness of the extremities; the pulse becomes weak; the respiratory movements are slow and feeble; a feeling of nausea is almost always present, and actual vomiting may occur. There is also more or less complete loss of consciousness, and the patient may suddenly fall to the ground in a state of complete insensibility. Syncope may be caused by disease of the heart or other organs of the body, but fainting attacks are not infrequently produced by mere emotional disturbance, or by exposure to a close and unhealthy atmosphere. Treatment consists in causing the patient to assume the recumbent posture or inducing him to sit with the head brought well forward between the knees, so as to encourage the gravitation of blood to the cranial cavity; in loosening clothing over the neck and chest to allow free play for the movements of respiration; in applying stimulant aromatic substances to the nostrils or dashing a little cold water over the face or chest; and in administering some form of stimulant such as brandy or sal-volatile.

Fairbairn, SIR WILLIAM, F.R.S., was born at Kelso, N.B., in 1789. After being educated as an

engineer at Newcastle-on-Tyne, he started business in Manchester at the age of eight-and-twenty. He directed his attention to the use of iron for construction, and, having been successful in several minor experiments, began in 1835 to build iron ships. His experience aided Stephenson in the carrying out of the Menai tubular bridge. Among many technical works he wrote *Iron: Its History and Manufacture*, *The Application of Iron to Building Purposes*, and *Iron Shipbuilding*. One of the originators of the British Association, he became its president in 1861, received the medal of the Royal Society, and was created a baronet in 1869, dying in 1874. His brother, Sir Peter, and his nephew, Sir Andrew Fairbairn, have been eminent as manufacturers and public men at Leeds, and his son, Sir Thomas Fairbairn, the present baronet, is an authority on matters of art and on the labour question.

Fairfax, EDWARD, an English poet, who flourished about 1600, in which year he published his metrical version of Tasso's *Jerusalem Delivered*, a work that received the praise of Waller, Dryden, and James I. He was also the author of a *History of the Black Prince* in verse and a prose treatise on *Demonology*.

Fairfax, SIR THOMAS, afterwards LORD, of the same family as the foregoing, was born at Denton, Yorkshire, in 1611. His father, Lord Fairfax, sent him to Cambridge, but he preferred arms to books, and went to Holland as a volunteer under Lord Vere, whose daughter he married. A strong Presbyterian, he espoused the popular cause in the Civil War, and after presenting to the king a petition on Heyworth Moor begging him not to raise an army, he received the command of the cavalry under his father, who had control of the northern forces. At first he was no match in Yorkshire for the Earl of Newcastle, but when he raised the siege of Nantwich, fortune turned in his favour, and he effected a junction with his father and with the Scots, by the side of whom he fought at Marston Moor (1644). In that year he was severely wounded in attacking Helmesley Castle, and the fact increased his popularity. January, 1645, saw him appointed commander-in-chief in place of Essex, with Cromwell as his lieutenant. Together they won the battle of Naseby, and crushed out the Royalist spirit in the western counties. He was now so completely under Cromwell's influence that he severed himself from the Presbyterians to support the more violent Independents. In 1647 he was Constable of the Tower, and in 1648, having succeeded to the title, he held command at the siege of Colchester. He was appointed one of the king's judges, but took no active part in the proceedings. When the Scots took up arms in 1650, he declined to march against them, resigned his command, and retired into private life until 1659, when he joined Monk and seized York for the reactionary party. He subsequently served on the committee despatched to the Hague for the purpose of bringing back Charles II. The last eleven years of his life were spent at his home in Yorkshire, where he wrote an account of his public career and several minor works, dying in 1671. He left no son, the title devolving upon his cousin.

Fairies, or ELVES, a collective name for certain supernatural beings that figure largely in European folk-lore. They are conceived as having human forms, but are generally, though not invariably, pictured as of diminutive size. The word *fairy* really means enchantment, the work of the fays—the term *fay* (Fr. *fée*, from Low Lat. *fata*) being originally used in Latin tongues to express the idea conveyed by *elf* in the Teutonic languages. But though this etymology rests on evidence, there is also a folk-etymology which ascribed "their most frequent name to their being a *fair* or *comely* people, a quality which they affected on all occasions, while the superstition of the Scots [who called them *fair-folk*] was likely enough to give them a name which might propitiate the vanity for which they deemed the race remarkable, just as they called them 'men of peace' and 'good neighbours.'" This quality, too, served to distinguish them from the dwarfs and gnomes, who were conceived as dark and swarthy. The notion of fairies seems to have been originally Celtic, and to have sprung from the nature-deities of Gaul, memories of which still survive in Brittany. But to this original notion the nymphs and fairies of classic times and the darker mythology of northern Europe contributed their share. According to Scott, fairies may "be described by negatives, being neither angels, devils, nor the souls of deceased men." They were supposed to dwell, under the government of a king or queen, in a land of enchantment. Their pageants and court festivities were gallant and splendid. The fairies were young and beautiful, dwelt in stately halls, enjoyed boundless wealth, rode on spirited horses, and hunted with hawks and hounds far surpassing those of earth. But all was illusion: when beheld by the eye of a seer the delights of this fairy elysium vanished, and the knights and ladies became wrinkled old men and hideous hags, just as the Lamia resumed her true serpentine form when looked on by one who knew her secret. Their pleasures were showy but unsubstantial, their activity unceasing, but fruitless; and their condemnation appears to have consisted in the necessity of maintaining the appearance of constant industry or pleasure, without deriving reward from the one or enjoyment from the other. Fairies were credited with carrying off children; and this was accounted for by the belief that they were bound to pay a yearly tribute to the Devil, and not unnaturally preferred to satisfy him with the children of men, whom they carried off, and in whose place they left their own puny offspring. Unbaptised infants were alone liable to be taken by the fairies; but adults, when engaged in certain unlawful deeds, might, even though baptised, be carried off to fairyland. On this superstition Scott's ballad of *Alice Brand* is founded, and it is worth careful study, for it is a compendium of fairy lore. In the Arthurian legend fairies play an important part: it was said that Camelot was "a city of enchanters built by fairy kings," and that Arthur was a

"changeling out of fairyland
Who drave the heathen hence by sorcery
And Merlin's glamour."

If the prologue to the *Wife of Bath's Tale* is to be taken literally, the belief in fairies was on the wane, and the fairies themselves were banished by the friars in Chaucer's day. But any scepticism that existed must have been confined to the learned, and the fairies evidently came back; for in the 17th century Corbet, Bishop of Norwich, in his *Fairies' Farewell*, tells us that they had just gone, owing to the New Faith. Neither friars nor New Faith, however, entirely drove out the old paganism, for even at the present day there are spots in Britain where fairies are occasionally seen; and in the south and west of Ireland many a farmer whose cattle do not thrive will consult the fairy-man (that is, one who has dealings with the fairies), rather than the veterinary surgeon.

Fairs (Lat. *feriæ*) are temporary assemblages of traders, differing from markets in being held only once a year, or at longer intervals, and being on a much larger scale. They probably grew up from the assemblages of traders attending religious festivals or political assemblies, the two being in early civilisation often identical. Traders are known to have assembled periodically from all parts of the civilised world at Tyre and Sidon; we hear also of their presence at the Greek games at Olympia, Delphi, and Corinth; while at Rome every ninth day (*nundinæ*), or, as we should count it, every eighth day, was the market day and day of assembly, and in a sense a religious festival. In Roman Britain there are some traces of fairs, and in the Anglo-Saxon period they also existed, probably accompanying political assemblages as at Rome. After the Norman Conquest the right of holding them was only conferred by royal grant, and in return for payment. It was often granted out to religious houses, who were authorised to maintain the fair on their own land, preserving order and levying tolls. Special courts of pie powder (*pieds poudrés*, dusty-footed, *i.e.* pedlars' or travellers' courts) were held for the trial of disputes arising at these fairs. Foreign traders were admitted to most of them, and freed at them from the various oppressive restrictions (*e.g.* as to responsibility for one another's debts) which ordinarily hampered them. Among celebrated fairs in England, Stourbridge or Sturbridge Fair, just outside Cambridge, was the most famous. The privilege of holding it was given by King John to the master of the Lepers' Hospital at Cambridge, but the town and the University, in consequence of its extreme importance to them, had also certain rights of control over it. This fair was one of the most important in Europe. It lasted for three weeks from Sept. 18. Its importance as a horse and cattle fair lasted later than that of its other functions; but it has gradually died down in the present century. Daniel Defoe has left a striking description of it in his *Tour*. Winchester Fair was of even more importance in the Middle Ages, as being near Southampton, the emporium of south-eastern trade. It was under the control of the bishop, and lasted for sixteen days from St. Giles' eve. Boston, St. Ives, Stamford, Oxford, Abingdon, and Nottingham had also important fairs. The dramatic booths, such as "Richardson's Show," and the various shows including giants, dwarfs, and other monstrosities, were naturally a prominent feature of these fairs. St. Bartholomew's Fair, popularly called Bartlemy Fair, in Smithfield, London, dates from 1133. In this century it gradually declined, and complaints of the immorality it engendered caused the City Corporation in 1839 to refuse to let any more stands for shows. In 1843 these were prohibited altogether, and the tolls generally were raised. In 1850 the fair was intermitted, and in 1855 the last was held. Indeed, the decay of fairs, owing to the better means of communication and development of commerce is one of the notable features of English economic history in this century. Shorn of their commercial importance they were resorted to chiefly for the purpose of revelry, and were the meeting-place of bad characters, while they came to interfere with the trade of resident dealers. The complaints of their immorality caused measures for their restriction early in the present reign. Thus 2 and 3 Vict., c. 37 (1839) authorised the holding of inquiries in London (within the metropolitan police district) as to the title to hold any fair, and if the title were not satisfactory the police were authorised to remove the booths, subject to the trial of the right in the Court of Queen's Bench on appeal to it by the alleged owner of the fair. In 1871 an Act was passed reciting that whereas certain fairs are unnecessary, are the cause of grevious immoralities, and are injurious to the inhabitants of the towns where they are held, the Secretary of State, on the representation of the magistrates in Quarter Sessions, and with the consent of the owner. might order any fair to be abolished. But horse and cattle fairs, cheese fairs, and hiring fairs for engaging farm servants, are still carried on in various parts of Great Britain.

Among foreign fairs, the great fair of Troyes, in Champagne, which was of much importance as early as Charles the Great's reign, gave its name to "Troy weight"—as the foreign coins naturally in circulation at it were reduced to a common denomination according to that standard. During the Crusades a great fair was held annually in September on Mount Calvary; it was attended largely by Venetian traders, and was one of the chief means by which Eastern goods reached Europe. The fairs of Rouen, Lyons, St. Denis, and St. Germain, near Paris, were celebrated among French fairs, as were those of Leipzig and Frankfort in Germany. The book fair at Leipzig has only recently been superseded by modern methods of conducting the bookselling trade. The great fair of Nijni Novgorod in Russia, covering altogether some seven or eight square miles, and increasing the population of the town fivefold while it is held, is the last and largest survival of the mediæval fairs. Goods of the value of £10,500,000 are said to have been offered for sale there in 1849. Most modern visitors, however, have been somewhat disappointed with the fair, which Russians extol as one of the wonders of the world; but the variety of nationalities collected at it

makes it remarkable. Fairs obviously belong to an early stage of commerce, and will probably soon everywhere be extinct. As a means of exhibiting goods they are replaced by the International Exhibition, to which the term is commonly applied in America; as a means of selling them, by the advertisement, the agent, and the commercial traveller, not to speak of the world-wide "connexion" which belongs to great modern producing firms. In America the term is often applied to local agricultural and other exhibitions (*e.g.* a "state fair") and to charitable bazaars, of which the "Sanitary Fair," held at New York in 1863 in aid of the wounded during the War of Secession, is an instance on a large scale.

Fairy Rings, circles of dark-green coarse grass in lawns and pastures produced by the centrifugal growth of the spawn or "mycelium" of various kinds of fungi. The fairy-ring champignon (*Marasmius oreades*) and the St. George's mushroom (*Agaricus gambosus*), both valuable as food, are among the commonest species that grow in this manner. The soil within the ring is impoverished, that immediately beneath the ring being temporarily enriched by the decaying crop of fungi. The mycelium dying at its centre while it increases centrifugally, the rings increase in each successive season. Besides the popular explanation that they are caused by the elves dancing in a ring, there have been various other attempts to account for them.

Faith, in Christian theology, usually means the assent of the soul to the promises of God and the revelation of His will coupled with the confidence that He will perform His promises. The term thus expresses both acceptance of a system of doctrine and confidence in a Person; and besides intellectual assent, it involves a special state of the emotions and direction of the will. As assent to a system of doctrine, it is often contrasted with reason. Reason draws a conclusion from premises, faith (it is said) deals with and accepts a conclusion which is beyond the reach of unaided human reason, but certified by a kind of inward revelation.

Faith Healing, a religions movement for the curing of disease by prayer and laying on of hands, which arose independently at Mainendorf, in Switzerland, and Motlingen, in the Black Forest, between 1850 and 1860. In the former case, Dorothea Trudel, an artificial flower-maker, in the latter Pastor Blumhardt was the originator. The movement spread into Sweden and America, and from the latter country into England, where houses for the treatment of sickness by this method have been established, called "Bethshan" ("house of safety"). A similar belief is held by a small English sect, the Peculiar People. It is based on a passage in the Epistle of St. James (v. 14). The cures, analogous to those effected by hypnotism (q.v.), and perhaps at some Roman Catholic places of pilgrimage—*e.g.* Lourdes—are in part susceptible of a rationalistic explanation. Confidence is well known to be a powerful auxiliary to cure, and it is probable that some at least of the illnesses cured may be put down to hysteria.

Faithfull, Emily, the daughter of a clergyman, was born at Headley Vicarage, Surrey, in 1835. She began very early to take an interest in the various questions that are included under the head of "Women's Rights," devoting herself particularly to the fostering of independent industries for women of the working class. With this view she started in 1860 a printing press in which female labour only was employed. The Queen patronised her scheme, and later on conferred a pension upon its originator. Besides many contributions to the press, Miss Faithfull is the author of a novel, *Change upon Change*, that met with considerable success a quarter of a century ago. She has delivered many lectures, too, upon the subject of her life's work, and has thrice visited America for the purpose of making known her principles.

Fakir (Arabic *fakir*, beggar), properly a member of a mendicant Mohammedan religious order, devoted to contemplation and contempt of this world. Strictly, therefore, the term is identical in significance with Dervish (q.v.), but in India the term is applied to any religious mendicant, though these are mostly Mohammedans. There are many orders of them. They are often half-insane, and not unfrequently impostors; but are maintained by a certain love of idleness, buffoonery and story-telling, which is a feature of many Eastern countries. Of the fakirs of India, some (the Mudaria) are often jugglers, or have performing bears or monkeys; some (the Sohagia) dress like women, play, sing, and dance; others (the Kafai) cut and wound themselves apparently without inconvenience; others beg at night only, carrying a lamp (Kaye and Watson: *Peoples of India*). There are cases on record, apparently well authenticated, in which fakirs have been buried alive for a considerable period at their own request.

Falashas, an Abyssinian people, who form a compact body in the province of Semen, about the head-waters of the Takazzé, but who are also found in scattered groups in all the surrounding districts as far south as the Abai (upper course of the Blue Nile). They are commonly known as the "Jews of Abyssinia," and there can be no doubt that they have practised Jewish rites from time immemorial, certainly long before the Christian era. But although they claim to be of the "House of Israel," and call themselves "Israel," they are not Jews or Israelites, but Hamitic aborigines of Abyssinia, closely allied in speech and physical appearance to the Agao of Lasta, and other indigenous populations. At least, if the Falashas, that is "Exiles," really represent the lost tribes, as some suppose, then it must be allowed that in the course of ages these Semites have become transformed to Hamites, both in their language and physical appearance; in these respects they are not distinguishable from the Hamitic element that forms the substratum of the inhabitants of Abyssinia. [Abyssinia.] M. d'Abbadie, while admitting the assimilation, still holds that they may have sprung from a Jewish colony that reached Abyssinia at the time of the Babylonian captivity, and in any case it is evident, from the widespread diffusion of the Hebrew religion, that

a considerable number of Jews must have penetrated to the plateau in remote times. Their gradual absorption amongst the surrounding population would present no difficulty, for similar results have been witnessed under similar conditions in many other regions. In their upland homes the Falashas are chiefly occupied with agriculture; but large numbers yearly emigrate to Gondar and other places, where they find employment as masons, woodcutters, water-carriers, workers in iron, and suchlike pursuits. None of their teachers have any knowledge of Hebrew, and their Bible is written in the Gheez, or ancient Himyaritic, which is also the liturgical language of the Abyssinian Christians. (Ant. d'Abbadie in *Nouvelles Annales des Voyages*, iii.; Stern, *Wanderings among the Falashas*, 1862; Beke, *On the Languages of Abyssinia;* Halévy, *Bull. de la Soc. de Géographie*, 1869.)

Falcon, any bird of the genus *Falco*, type of the family Falconidæ (q.v.), with twenty-seven species, universally distributed, except in the Pacific Islands. They are distinguished by the short, stout beak, very distinctly toothed, well-marked, generally yellow cere, long, pointed wings, and long, rounded tail. The outer toe is longer than the inner (except in the gyrfalcons), and the lower part of the leg is covered with scales arranged like network. These birds are noted for their high courage, keen vision, and swift flight, which when in pursuit of prey has been estimated at 150 miles an hour; and many species have been partially domesticated for hunting other birds and ground game. The Peregrine Falcon, formerly common, but now rare, in Britain, is bluish-grey, narrowly barred with black above, and reddish-white with transverse black bars below. The length of an adult male is about 15 inches; the female is somewhat larger, and has a more decidedly rufous tinge on the under surface. It is the female that is *the* falcon of sportsmen; the male is a *tiercel*, and a bird caught wild in full plumage is a *haggard*. These birds prey on partridges, grouse, and plover, and sometimes on marine birds. Some authorities attribute the grouse disease to the destruction of falcons, which, it is said, by destroying sickly birds aided in the perpetuation of a vigorous race. There are closely allied forms in the southern hemisphere, chiefly distinguished by darker plumage. The gyrfalcons (that is, the falcons that fly in gyres or circles), have a more northerly range, and are sometimes made a distinct genus (*Hierofalco*). The Norway gyrfalcon (*F. gyrfalco*), a rare British visitant, the Greenland (*F. candicans*), almost pure white, the Iceland (*F. islandus*), and the North American gyrfalcon (*F. labradorus*) have their habitats pretty accurately defined by their popular names. The Merlin (*F. æsalon*) and the Hobby (*F. subbuteo*) are British species, somewhat resembling, but smaller than, the Peregrine Falcon. The Lanner (*F. lanuarius*) and the Saker (*F. sacer*) are natives of South-Eastern Europe and the adjacent parts of Asia and of North Africa. [KESTREL.]

Falcon, a cape in Algeria, forming the W. limit of the Gulf of Oran.

Falconer, HUGH, was born at Forres in 1808, and, after taking the degree of M.D. at Edinburgh, entered the service of the East India Company. His botanical and geological investigations were highly valuable, but his chief claim to distinction is the introduction of the tea-plant into India. The British Museum had the benefit of his services for several years, and he died in London in 1865.

Falconer, WILLIAM, born at Edinburgh in 1732, of humble parents and brought up as a sailor, developed a taste for poetry, and in 1751 produced some verses on *The Death of the Prince of Wales*. About ten years later he brought out *The Shipwreck*, based on his personal experiences, and became famous. He now left the sea for a time, and lived in Scotland with his relative, Robertson, the historian, compiling a useful *Marine Dictionary*, and a political sketch entitled *The Demagogue*. He tuned his lyre also to the praise of the Duke of York, and was rewarded with the post of purser to the *Royal George*. In 1769 he sailed on board the *Aurora* for the East Indies, but the vessel was never heard of again.

Falconidæ, a universally distributed family of Birds of Prey (q.v.), with about 70 genera and more than 300 species, distinguished by having the head and neck feathered, the beak stout and strong, the nostrils separated by a bony partition, the eyes deep set, with the upper margin of the socket projecting so as to form a kind of eyebrow, and the feet furnished with sole-pads, and strong sharp claws admirably fitted to hold and rend their prey. [BUZZARD, CARACARA, EAGLE, ERNE, FALCON, HARRIER, HAWK, KITE, etc.]

Falconry, the taking of game by trained hawks, has been practised from very early times in China and India. Layard found it figured in the sculptured ruins of Khorsabad, and it is depicted on some Egyptian monuments. Allusions to it are found in some Roman poets, and it was a favourite sport in the Middle Ages. King Alfred is said to have written a book on it. Harold appears in the Bayeux tapestry carrying a hawk on his fist. Laws of William the Conqueror rigidly regulated the keeping of hawks and falcons, the nobler kinds being reserved for the king and the great nobles. It was not till Magna Charta that the right was secured for every freeman "to have eyries of hawks and falcons in his own woods." Stringent laws, too, were enacted respecting the theft or unlawful possession of hawks. Shakespeare constantly alludes to the sport, which was affected by the fair sex (Mary Queen of Scots, for instance, when in captivity was entertained with hawking), and flourished until the 17th century, when Puritanism and the Civil Wars caused its decline in England, as the religious wars of Germany did in that country. At the Restoration it revived slightly, and has been practised in England by a few enthusiasts down to the present day. A revival in Holland about 1840 has contributed to its continuance with us. But the development of the gun and the enclosure of land have killed it, just as they have favoured battue shooting and decreased the

importance of trained sporting dogs. Open country is requisite for the sport, as the falconers have often to gallop some distance after the hawk. In kite-hawking runs of five or six miles were not unknown. Though when the "fowling-piece" was little developed more game could be taken by hawking than in other ways, rooks, larks, ravens, kites. and magpies were also pursued, as being high flyers and strong on the wing. Heron hawking was a favourite sport. Pheasant hawking was sometimes pursued with dogs, which found the hawk when she had dropped on her prey. Hares, rabbits, and grouse were (and are) hawked. Female hawks and falcons are preferred, being larger and more powerful than male. Falconers divide them (*a*) into long-winged (falcons) and short-winged (including the goshawk, merlin, and sparrowhawk), and (*b*) into haggards or passage-hawks (wild birds caught and trained) and eyases (birds brought up from the nest). Haggards are trained by being kept continuously hooded for a time, meanwhile being accustomed to be carried on the fist, and to the voice. They are then at first fed with a "lure" (a dead bird, or an imitation of one baited with meat). Eyases, after being accustomed to the bell and strap (see below) are allowed to prey for themselves for a short time, but will come back to be fed and so are recaptured. In flying the birds they are taken out on the fist, hooded and wearing two short leather straps (*jesses*), one of which is permanently attached to each leg. A leash is run through these, and a light bell also attached to the leg. When game is started the bird is released, unhooded, and "flown at" it. Sometimes this is done before the game is found, when the bird will "wait on" above the party till the prey is started. The hawk then rises, usually at last flying round and round the prey (or "quarry") in large and gradually ascending spirals, and finally swooping down on it. Meanwhile the falconers ride after her, tempt her away with a lure, and hood her again. Great pains are taken in the training to teach the hawk not to carry her game. Falcons are, of course, the most esteemed of the birds used; they have occasionally been obtained from Norway and Greenland. The peregrine falcon is the most usual. Goshawks have now and then been used. The merlin is flown at larks, the tiercel or male peregrine at partridges, pigeons, and magpies. The sport has a most elaborate vocabulary.

Falemé, a tributary of the Senegal river in Senegambia. W. Africa. Rising in the borders of the Mandingo country, it flows N.W. for about 200 miles, and joins the Senegal near Bakel.

Falernian Wine, celebrated by Horace, was grown on the Massic Hills in Campania. In Pliny's time its quality was declining. A modern Italian brand has appropriated the name.

Fali, a negroid people of Adamawa, Central Soudan, between the upper course of the Benue river and the southern frontiers of Baghirmi. Next to the Battas. the Fali are the most numerous nation in Adamawa, comprising as many as fourteen distinct branches. Their speech differs fundamentally from all the surrounding languages, and the Fali are also distinguished by a relatively fair complexion, in this respect resembling the Fûlah intruders more than the negro aborigines of Adamawa. Some are found mixed with Beles, and others in the province of Kalam, on the Bornu frontier. (Barth, *Travels*, vol. ii.)

Faliero, ORDELAFO, Doge of Venice in 1102, in which year he took a fleet to aid Baldwin, King of Jerusalem, against the Saracens. He added Dalmatia, Croatia, and other territories to the possessions of the Republic, and was killed at the siege of Zara in 1117.

Faliero, or FALIERI, MARINO, a Venetian of illustrious family, who in 1354, after many services to the state, was elected Doge at an advanced age. He entered into a conspiracy to massacre the senators and nobles, but his design being detected, he was beheaded (1355), and, instead of his portrait in the long line of chief magistrates preserved in the palace, there is a picture of the throne covered with a pall. Byron, who has made his fate the theme of a drama, attributes his treason to anger provoked by insults to his young wife.

Falk, DR. PAUL LUDWIG ADALBERT, the son of a Lutheran pastor, at Metschkau, Silesia, was born in 1827. He graduated at the university of Breslau, embraced the profession of the law, and was gradually promoted from one judicial post to another until in 1868 he was appointed councillor to the Ministry of Justice in Berlin. Having previously sat in the Prussian House of Deputies and the North German Reichstag, he became a member of the first Imperial Parliament, and was chosen by Bismarck in 1872 as Minister of Public Worship. His policy aimed at diminishing the power of the Romish Church in North Germany, and with that end in view he framed a series of repressive enactments known as the Falk Laws. These measures brought upon him great unpopularity, and he resigned in 1879.

Falkirk, a parliamentary borough of Stirlingshire, is situated on a slope overlooking the Carse of Falkirk, and near the canal that connects the Forth with the Clyde. It is connected by railway with Edinburgh and Glasgow, from each of which it is little more than 20 miles distant. The church, rebuilt in 1810, contains some ancient monuments, and the town possesses the usual public buildings. There are no important manufactures, but the market is well supplied, and the three cattle fairs or "trysts" rank among the chief in Scotland. The Carron and other iron-works are in the neighbourhood. In conjunction with Lanark, Hamilton, Airdrie, and Linlithgow, Falkirk sends one member to Parliament. Two great battles have been fought here. In 1298 Edward I. defeated Wallace, and in 1746 the Young Pretender routed the forces of the Crown.

Falkland, LUCIUS CARY, VISCOUNT, was born at Burford, Oxfordshire, in 1610. At Trinity College, Dublin, and at Cambridge he laid the foundations of a scholarly education, and was distinguished for his knowledge of Greek. Succeeding to his father in 1633, he held an appointment in the Royal

Household, but abandoned it to join as a volunteer in the expedition of 1639 against the Scots. In 1640 he entered Parliament, supported the prosecution of Strafford, and displayed strong sympathy with the popular cause. However, on the outbreak of Civil War he preserved his allegiance to the king, and became Secretary of State, though he felt deeply the wrongs of the Commons, and abhorred the double-dealing of his royal master. His courage in the fight at Edgehill was as conspicuous as his humanity after the battle was over. At Newbury he joined Lord Byron's cavalry as a volunteer, and was shot in the front rank (1643). Clarendon uses the highest language of commendation in describing his character, and all his contemporaries regarded him as the most virtuous and enlightened man of his age. He wrote a *Discourse on the Infallibility of the Church of Rome*, and is believed to have helped Chillingworth in his *History of Protestantism*.

Falkland Islands, THE (Fr. *Les Îles Malouines*), a group of some two hundred islets off the E. coast of South America (lat. 51° to 52° 30′ S., long. 57° 40′ to 61° 20′ W.). They were discovered by Davis in 1592, colonised by France in 1763, taken by Spain in 1767, and ceded to England in 1771, but not permanently occupied until 1833. Of the total area of 6,500 square miles, East Falkland and West Falkland make up five-sixths. The population, amounting to about 2,000, is principally engaged in sheep-farming, and frozen meat is exported in considerable quantities. Stanley Harbour on East Falkland is the chief town, and the residence of the governor. The climate, though wet and windy, is not unhealthy. The uninhabited group of South Georgia is attached to the Falklands. The coasts are much indented, and the climate cold, damp, rainy, and foggy. Wheat will not ripen, and there are no trees—the "vatchinal," a woolly ragwort (*Senecio candicans*), 3 to 4 feet high, being the tallest plant. Most of the interior is covered by a thick peat formed of the stems of the "diddle-dee" or crowberry (*Empetrum rubrum*), the "Malvina tea" (*Myrtus nummularia*), a marsh-marigold, and sedges. On the bog are the round lumps of the "balsam-bog" (*Bolax glebaria*), a very slow-growing and condensed umbelliferous plant, which exudes a resin. The plants are from 3 to 8 feet in diameter. On the sandy shores grows that sweet and valuable fodder plant the "tussock-grass" (*Dactylis cæspitosa*), which has been introduced into the Hebrides, these islands in many respects resembling the Falklands. A wild fox is now extinct, and seals and whales have almost disappeared from the coasts. Penguins, wild geese, and other sea-birds are numerous. Mount Adam, the highest peak, is 2,315 feet. The rocks are sandstones, clay-slates, and quartzites, the latter forming conspicuous projecting white dykes and breaking up into the remarkable "stone-runs" which occupy many of the valleys. Most of the islands, the sheep, and the trade, are in the hands of the Falkland Islands Company.

Fallacy, unsound argument, or mode of arguing, leading to a specious but erroneous conclusion. The ingenious puzzles of the later Greek sophists, and the more serious arguments, seemingly unassailable yet leading to a palpably false conclusion, of the Eleatic and Megarian schools in Greece, were of great use in stimulating logical theory. Many of these were dealt with by Aristotle in the earliest treatise on fallacies, the *Sophistici Elenchi*. Later logicians classified fallacies as formal and material. In the former the fault is in the reasoning; in the latter it is in the premises, and they are therefore outside the scope of logic proper. A number of formal fallacies are enumerated in the ordinary text-books of logic. Bacon's enumeration of *idola*, or phantoms, which prevent the reception of scientific truth (individual and racial prejudices: prejudices due to language, and false philosophical theories), is in some degree a classification of fallacies. J. S. Mill classed fallacies under five heads: (1) Simple Inspection; (2) Observation; (3) Generalisation; (4) Ratiocination; (5) Confusion.

Fallopius, or FALLOPPIO, GABRIELLO, was born at Modena about 1523. In 1550 he succeeded Vesalius as anatomical professor at Padua, and died there in 1562. In his short career he contributed much towards creating the rational science of anatomy, and his name is associated with the discovery of the "Fallopian" tubes, and with the investigation of the structure of the ear.

Falloux, FRÉDÉRIC ALFRED PIERRE, COMTE DE, was born at Angers in 1811. He devoted himself to politics, espousing with warmth the cause of the Bourbons and the *ancien régime*. After expressing his views in a couple of historical works on Louis XVI. and Pius V., he obtained admission to the Chamber of Deputies, where he allied himself with Montalembert and Berryer, taking a special interest in educational questions. In 1848 he opposed the Revolution, and supported the occupation of Rome. Louis Napoleon, as President, gave him the portfolio of Public Instruction, but after the *coup d'état* he retired into private life, dying at his country-house near Angers in 1886. He was elected to the French Academy, and wrote in his later years one or two devotional works and a history of *La Convention du 15 Septembre*.

Fallow, a portion of land left for a time without a crop to get rid of weeds, to render the soil more friable by exposing it to frost and drought, and to enable a fresh supply of soluble mineral substances, which may have been exhausted by previous crops, to be formed. This last object will be accomplished by water drawn up from below by capillary action; by substances brought down in small supplies by rain; by dust; by the action of earthworms; by atmospheric oxidation and hydration, and other spontaneous decompositions of previously insoluble mineral substances in the soil; and by nitrification (q.v.). Fallowing may be looked upon simply as a prolonged process of tillage. It differs in duration, "green crop fallow" extending from harvest to the time for sowing turnips and analogous crops in the following spring, and "summer," or "naked, fallow" continuing through the summer until the time for

sowing autumn-sown wheat. Green crop fallowing begins with paring the stubble-fields directly they are reaped, and harrowing off the weeds, or using a "grubber," and leaving the weeds to be killed on the surface by winter frosts. Manuring is then carried out at once, and in the following spring the soil may be freed from weeds and loosened to the depth of 6 or 8 inches necessary for drilling green crops by the use of light grubbers. The longer "naked" fallow is now only used on very stiff clay soils. It consists in deep ploughing in autumn; a second ploughing and two cross-ploughings in spring; stirring by the grubber and harrow, so as to expose the weeds to drought, as often as possible in the summer; manuring in July; and adding lime, if necessary, before the final ploughing or "seed-furrow."

Fallow Deer (*Dama vulgaris*), a partially domesticated deer kept in parks in Britain. Its home appears to be the south of Europe and the north of Africa; but there is no exact knowledge as to how it was introduced into the north of Europe. When adult it stands about 3 feet high at the shoulder; the summer coat in both sexes is yellowish-brown spotted all over white, and in the winter the colouring becomes more sombre. The darker variety is said to have been introduced from Norway by James I. The venison is much esteemed. Only the buck has antlers; these appear in the second year, increasing in development till the sixth, when the animal is a "complete buck." They then have two tines, and are palmated in the upper parts, the expanded portions giving off snags on the posterior surface. In the Persian Fallow Deer (*D. mesopotamica*) the palmation is at the base instead of at the extremity.

Fall River, THE. [VAAL RIVER.]

Falmouth, a parliamentary and municipal borough and seaport in Cornwall, on a branch of the estuary of the river Fal, 79 miles S.W. of Exeter and 14 miles N.N.E. of the Lizard Point. It has an excellent harbour, 5 miles long by a mile broad, with numerous creeks. Hence it used by vessels of the royal navy and by several lines of steamers, being the most westerly port in the Channel. Pendennis Castle commands the entrance, and is faced by St. Mawes Castle on the opposite bank. The coasting trade is considerable, and the pilchard fishery employs many of the population. There is little of antiquarian interest in the town, of which nothing is known before the middle of the 17th century. With Penryn it returns one member to Parliament.

False-bedding, also known as *current-bedding* or *oblique lamination*, is the inclination of shallow water deposits, whether marine or estuarine, at various and high angles even in a very small space, instead of their lying horizontally. It is the result of conflicting currents heaping the material up in various directions, and a similar appearance is produced in railway embankments, rubbish-heaps, etc., by the tilting of various material from different directions. It is a common indication to the geologist of shallow water conditions, as in the variegated sands of the Trias in Cheshire, the flags of the Forest Marble, the silver sands of the Folkestone Series in the Lower Greensand of Kent and Surrey, and the gravels of the Lower Thames valley.

Famagosta (ancient *Arsinoe*), a seaport and capital of a district on the E. coast of Cyprus. In the palmy days of Venice the port did a great trade with the East, but it is now a wretched and half-ruined settlement, accessible only to vessels of light burden. Some improvement has taken place under British rule. In the vicinity are the remains of Salamis and Constantia, marking the site of the ancient city.

Familiar, FAMILIAR SPIRIT, the supernatural attendant and servant of a magician, or witch, generally assuming the form of one of the lower animals. This meaning seems to have arisen from the particular sense of the Latin *famulus* = a servant of the gods (*Ovid: Metam.*, viii. 272). The "familiar spirit" of the Authorised Version appears to have been an indwelling and controlling influence rather than an entity external to the witch or diviner; and this difference will be clearly brought out if one compares the passages in which this expression occurs with the corresponding ones in the Vulgate. In the Middle Ages the notion of familiar spirits was widely diffused, and during the witch mania any old woman who kept a pet cat or dog was almost sure to be denounced as a witch. In the Faust folk-legend and in Marlowe's version Mephistopheles is a true familiar spirit; in Goethe's poem he is THE Devil, *der Junker Satan*, as he is called by the old witch who brewed the broth that made Faust young again. [FAUST.]

Family. 1. A word of Italic origin, which came into English, through the French, from the Latin, in which tongue it signified (1) The whole number of slaves belonging to one master; then (2) A house and all belonging to it, a household; and (3) One of the units of which a *gens* was composed—*i.e.* a group of persons tracing their descent through the male line back to a common ancestor. [AGNATES.] Andrew Lang defines the family as "the small community formed by the union of one man with one woman, and by the increase of children born to them." When this union has moral and legal sanction it gives us the family of modern times and the unit of civilised society, though the term is often extended so as to include relatives of both parents.

If families had been formed on one uniform plan at all times, and all the world over, nothing would be easier than to construct a workable hypothesis of how aggregations of families formed groups or tribes, and how these tribes gradually coalesced with others, to form a nation. So far, however, from this having been the case, the family has not only been a most inconstant quantity in the past, but is actually so—though, of course, in a less degree—in the present. The family of the people of London, or Paris, or Vienna, where the children belong to the father is not the same as the family of the Cingalese, where the father has no claim to his offspring, who belong to their mother; and the Cingalese family differs again from that of the

Todas of southern India, where "the marriage system is elastic, and when women are scarce several men have to be content with one wife between them; but as women become more numerous, a greater proportion of men are able to procure a wife apiece."

It was till quite recently assumed that the primitive family consisted of the man, as head, with his wife or wives, children, and servants, or slaves, over all whom he exercised unlimited control, necessary in early times, but since limited by law and custom. As the Roman *familia* in course of time grew into a *gens*, and as the Twelve Tribes were said to be the descendants of the sons or grandsons of Jacob, it was reasoned that tribes and nations everywhere originated in a similar way. But kinship in the Roman family was reckoned on the father's side only; in many cases in the book of Genesis it seems to be reckoned on the mother's side. Professor W. Robertson Smith (*Kinship and Marriage in Arabia*, ch. vi.) says that "Eve is the personification of the bond of kinship (conceived as exclusively mother-kinship) just as Adam is simply man, *i.e.* the personification of mankind." And speaking of the account of the institution of marriage (Gen. ii. 24), he remarks: "It reminds one of the well-established custom of marriage in Ceylon, where the woman remained with her kin, and chose and dismissed her partner at will, the children belonging to her kin, and growing up under her protection." This form of union McLennan calls *beena* marriage from its native name; and there are many examples of it in the first book of the Hebrew Scriptures. Lamech seems to have been the first polygamist (Gen. iv. 19), but his example was followed by the Patriarchs. But this polygamy would not of itself militate against agnatic kinship, for the chastity of married women was, in later times at least, rigidly guarded, and any breach of it strictly punished (Lev. xx. 10). Abraham did not dwell with his mother's kindred; but Sarai gives him Hagar the Egyptian, that she, the barren wife—not the husband—"may obtain children by her" (xvi. 13; cf. xxi. 10).

The marriage of Isaac was by purchase, and the dowry was given to the bride's brother and mother, not to her father (xxiv. 53). But marriage of the *beena* type seems to have been quite familiar both to Abraham and to the "eldest servant of his house," who was to seek out a wife for Isaac, for the servant puts the case to his master thus—"Peradventure the woman will not be willing to follow me unto this land: must I needs bring thy son again unto the land from whence thou camest?" [*i.e.* that he may be received into his wife's family] (xxiv. 5). In this marriage the wife's kindred asserted no claim to her children, for she was purchased (cf. xxiv. 12). But when Jacob carried off his wives, Leah and Rachel, and his children, Laban pursued him, and asserted his right to them, calling them "my sons and my daughters" (xxxi. 28, 55). Another notable example of this type of marriage is that of Samson with the Philistine woman (Judges xiv.–xv. 2). And for direct evidence that kinship on the mother's side was reckoned as kinship by blood, *see* Gen. xxix. 14, 15; Judges ix. 1–4.

The custom of the Levirate (Deut. xxv. 5–10), by which the brother of a man dying without issue was bound (under penalty of being publicly dishonoured) to marry the widow, must have tended to complicate relationships among the Hebrews. This custom, however, was widely distributed, and still exists in many places among races of low culture, and this whether the surviving brother be already married or not (Lubbock: *Orig. Civil.*, ed. 1882, pp. 141, 142). The Levirate seems closely akin to the so-called Tibetan polyandry, where a group of brothers have one wife between them, and the children can trace their descent to a common grandfather, though not to a common father. Something similar seems to have prevailed among our own ancestors in Cæsar's time (*De Bello Gal.* v. 15), though there husbands in succession seem to have joined the union, and all the children were reckoned to belong to him who first married the woman. But in the family of civilised life kinship is always reckoned on the father's side. How then did this originate? Polygamy (q.v.), if the chastity of the wives be ensured, might, and doubtless did, give it, to a certain extent. Polyandry except of the Tibetan type would not do so, so that where kinship is reckoned through the mother one may expect that polyandry has prevailed, probably from scarcity of women—in its turn generally due to infanticide (q.v.) and leading to marriage by capture. The upward struggle from either of these types to the modern monandrous family must have been long and arduous. With primitive man unions were probably temporary. According to Darwin he would either live with a single mate or be polygamous, and the most powerful males would secure, and be able to defend, the most attractive females. But as they would be governed more by their instincts than by their reason children would be numerous; and thus the struggle for existence would be rendered severe. And it is clear that it was not till man had attained a fairly high degree of culture that the monandrous family arose in the form we know it, in which the union is lifelong, and imposes far more important duties on the husband than the mere support of the wife and the procreation of children. [MARRIAGE.]

2. In *Zoology*, a group of genera agreeing in general characters. The names of families are obtained by adding *-idæ* to the stem of the name of the type-genus. Thus from *Otaria* we get *Otariidæ*, the family containing the eared seals; from *Felis* we get *Felidæ* = the Cat family. [GENUS, PHYLUM SPECIES, TAXONOMY, ZOOLOGY.]

Famine (Latin *fames*, hunger) a scarcity of grain, or other staple food of a people, such as to produce general starvation. Its causes have been classed as natural and artificial. *Natural* are either drought, generally in tropical countries, or excessive rain in more northern climates; inundations; the inroads of destructive insects—*e.g.* locusts, and (much less frequently) storms, high tides, volcanic eruptions, and now and then pestilences. Destruction of forests is a frequent cause of drought, and sometimes of flood; since the rain then runs off more rapidly, denuding the slopes

of earth, and overlaying the natural drainage. Hence great attention is now paid to the conservation and replanting of trees, especially in India and on the Continent. [FORESTRY.] Flooded land becomes heavy and sodden, and apt (partly from the destruction of the earthworms) to cake and prevent air reaching the roots of the vegetation. Wet seasons too often promote mildew and various blights, as in the Irish potato famine. Artificial causes, which mostly however are only subsidiary to natural, are wars, restriction of the free passage of goods, and, according to Mr. Walford (*see* below) debasement of currency. An attempt has been made by Mr. J. N. Lockyer to connect the periodical failure of the rains in India with the eleven-year periods of the occurrence of sun-spots (q.v.), which are signs of internal solar activity; but the records available only extend over the last seventy years.

Until civilisation is tolerably advanced and variety of industry and facilities of communication are pretty thoroughly established, almost every community is within measurable distance of famine once a year. Spring is called by the Greek poet Alcæus, "the time when all is blooming, but there is not enough to eat." Again, between 1066 and 1600 about fifty famines are recorded in England alone—on the average, about one every nine years. Clearly, when a population chiefly produces food for its own consumption, has little stored wealth, or coined money, and poor communications, any failure of crops in a district must mean distress. This was one cause of the great Irish famine. Agriculture was the staple industry, and little coin was in circulation. Again: population tending to multiply up to its means of subsistence, a people that lives on the cheapest staple food available is always liable to famine should that fail. This was the case in the great Irish famine of 1845–47.

The means of coping with famine have been much discussed, especially with reference to India. Irrigation works are an obvious preventive, and many have been constructed; but it has been questioned if they can generally be commercially successful, and, if not, how can they be paid for by a people which has so little taxable surplus? Conservation of forests is a preventive more generally accepted. Improved communications—*e.g.* railways—are of use less as facilitating transport of grain in a famine (since the people have then nothing to buy it with) than in stimulating production in good years by opening up markets, and so enabling the cultivators to acquire and store wealth. Relief works are commonly opened in Indian famines, as during the Irish famine of 1845–47; but the labour of half-starved men is not of much use, and the works have necessarily been hurriedly and often unskilfully planned. Variety of industry, variety of crops, and free movement of goods are obvious preventives and palliatives. Still more efficient is a tolerably high standard of comfort, preventing increase of population up to the limit of subsistence. The most civilised part of the world, it may be said, is tolerably free, on the whole, from any danger of severe famine, until (according to Malthus's theory) food production reaches its ultimate limits and population overtakes it. It has been estimated recently that the world will be pretty well filled by the end of the 20th century, but much industry has recently been expended by Prince Kropotkine and some American writers in showing that the limit of food-production is indefinitely remote.

Mr. Edward Walford in a remarkable paper (*Journal of the Statistical Society*, vols. xlii. xliii.) established inductively the connection between famines and the causes above mentioned, and gave a list of 350 recorded famines, of which the following may be cited:—

A.D. 879.—Universal famine.
1058–1065.—Seven years' drought in Hindostan.
1069–1072.—Famine, after Norman Conquest, in England.
1065–1072.—Seven years' drought in Egypt, and pestilence.
1316–1317.—Great dearth in England (from wet seasons).
1347.—Italy (followed by pestilence—two-thirds of population destroyed).
1527.—Severe famine in England.
1769–70.—Terrible famine in India; a million people died.
1822.—Irish famine.
1846–47.—Irish famine: about 275,000 died of starvation; some estimates place the deaths from starvation and pestilence combined at over a million. These, with emigration, reduced the population by two millions.
1865.—Great famine in Orissa, India.
1877.—Southern India: very extensive.
1877–78.—Famine in North China due to floods in some districts, drought in others: between three and four million persons required relief.
1878.—Morocco.
1892.—Russia (due to drought from destruction of forests).
[Twenty-nine great famines occurred in India between 1770 and 1877.]

Fan. 1. An instrument used to create a current of air. Hand fans are figured on Egyptian monuments dating as far back as the 17th century B.C., the kings being portrayed, at Thebes, for instance, as surrounded by fan-bearers. In Assyria, in China, in Persia, and in India, the use of the fan goes back to a remote antiquity. The materials were often feathers, or still oftener paper spread over a frame of stiffened wood or bamboo. In Greece fans date at least as far back as the 5th century B.C. Euripides in the *Helen* attributes their use to that queen and speaks of them as Phrygian. In Rome, too, they were much used. Both Greeks and Romans rarely fanned themselves; usually a female slave or eunuch was employed, but Ovid in the *Ars Amatoria* mentions fanning as one of the attentions paid to a lady by her admirers. Men, too, were (at Rome) often fanned by their slaves. In some Pagan religious ceremonies fans were carried, and in the early Western Church they were used to keep flies from the sacred elements. In the Eastern Church they are still used, and are (it is said) one of the insignia of the deacon. In Greece and Rome they were used as a bellows by cooks. All early fans, however, were non-folding. The folding fan is said to have originated in Japan, and to have been imitated in China. In the early Middle Ages Eastern fans were imported from the Levant by the Venetians. They were introduced into England during the reign of Richard II., and became fashionable in France through the example of Catherine de Medicis. Watteau, Laucret, and other distinguished painters

have frequently adorned fans with their paintings. Folding fans are largely manufactured in China, but commonly reserved for the European market. Paris and the neighbouring departments (especially the Seine-et-Oise, where wooden frames are made) are the chief European seat of the manufacture. Of late years the use of the fan in decoration, in imitation of Japanese art, has been very general in England. A wood or ivory frame, and a covering of decorated paper, silk, satin, or feathers, or combinations of these materials, make up the modern folding fan, which is both graceful in itself and lends itself to graceful uses. Thus, in the last century, there was a regular code of signals with the fan (described by Addison in the *Spectator*); for instance, the manner of holding it indicated the political creed of the holder, and it was a recognised instrument of flirtation. Possibly the use of the fan to cool the air [PUNKAH] was suggested by the winnowing fan, from which the various mechanical fans to create a draught or get rid of waste material are doubtless derived.

2. In *Engineering*, a special form of blowing machine for the purpose of creating a draught. The most generally adopted form is that known as the centrifugal fan, on the same principle as the centrifugal pump. A wheel with specially shaped vanes is made to rotate in a metal chamber. The air is drawn into the wheel and forced out in a definite direction by the rotating vanes. Such fans are much used for ventilation and for the production of forced draughts in furnaces.

Fandango, a lively Spanish dance in triple time, danced by a male and a female dancer beating castanets, to the accompaniment of the guitar. The man sometimes carries a tambourine.

Fans, a numerous and powerful people of West Central Africa, who since the middle of the century have been steadily advancing from the interior towards the coast, where they have been settled for some years in the Ogoway and Gaboon basins. The national name *Fan* (plural *Ba-Fan*), means "man," and occurs in several forms, such as *Faon*, *Fanwe*, *Panwe*, *Paouin*, *Pahouin*, this last being generally adopted by French writers. On the seaboard they form two great divisions, the *Maké-Fan* or *Osyeba*, south of the Ogoway, and the *Mbelé-Fan* or *Mpangwe*, north of the Ogoway, both subdivided into endless tribal groups, all speaking dialects of the same language, which seems to be remotely allied to the Bantu family, and all sharply distinguished in their physical appearance from the surrounding negro populations. The features are far more regular, the complexion much lighter, and often inclining to a yellowish hue, the hair less kinky, the beard fully developed, the figure tall, slim, shapely, and muscular. They have a sinister look, and seldom laugh; but are brave, intelligent, and even truthful and trustworthy. The Fan domain extends inland for an unknown distance, in the direction of the Niam-Niam people, whom they resemble in their pronounced cannibal tastes, in the manner of dressing the hair, in the use of bark coverings, vegetable dyes for painting the body, many-pointed iron darts, leopard skins worn by the chiefs, and in many other respects. They are excessively fond of ornaments, intertwining the hair with feathers and beads, encircling neck and waist with strings of cowries and buttons, while many of the women are so overladen with copper bangles, armlets, and anklets, as to make locomotion almost impossible. Nevertheless, they are the most vigorous and industrious of all the peoples on the seaboard, skilled forgers and armourers, potters, boat-builders, and husbandmen. In the regions known to the whites they number at least 200,000 souls, and here they are increasing rapidly, both by constant migrations from the interior and by the natural increase of births over deaths. Hence they are much feared by all the neighbouring peoples, whom they tend to crowd out or enslave, and whom they easily overmaster wherever they present themselves. (Capt. Burton, *Gorilla Land*, i.; Winwood Reade, *African Sketch Book*, i.; Oscar Lenz, *Skizzen aus W. Afrika*, Berlin, 1878; S. de Brazza, *Bull. de la Soc. de Géographie*, 1877.)

Fanshawe, SIR RICHARD, born in Hertfordshire in 1608, and educated at Cambridge, was employed by Charles I. as resident-minister at Madrid. In 1641 he returned to take up arms for the king, but, being made prisoner at the battle of Worcester, remained for several years in captivity. After the Restoration he was sent first to Ireland, then to Portugal, where he negotiated the king's marriage, and lastly to Spain, in which country he died in 1666. Among other literary performances he translated Guarini's *Pastor Fido* and the *Lusiad* of Camoëns into English verse.

Fanti, a negro people of the Gold Coast, who belong to the same stock as the Ashanti, and speak the Akân, a dialect of the same Tshi language. But from remote times the Fanti have been the deadly enemies of the Ashanti, and have always allied themselves with the English in their wars against that nation. Their chief town is Abra, twelve miles from the coast, and the English stations of Elmina, Cape Coast Castle, Anambu, and Winebah are all in Fanti territory, which is now comprised in the British protectorate. Those of the seaboard are chiefly occupied with fishing and navigation, while the more inland tribes are traders, hunters, and agriculturists. Like all Tshi-speaking peoples, the Fanti are of the true negro type, as distinguished from the negroids of the Mohammedan states to the north, and the Bantu populations of the Congo regions to the south. In the 17th century they extended from the Iron Hills to Salt Pond, and at that time their territory comprised the states of Commani, Fetu, Sabu, and Fantyn (Fanti), all of which have disappeared except the last. (Brackenbury and Huyshe, *Fanti and Ashanti*, 1873; Major A. B. Ellis, *The Tshi-speaking Peoples of the Gold Coast*, 1887.)

Fan Tracery, in *Architecture*, a kind of vaulting in which all the ribs that rise from the spring of the vault have the same curve and extend equally in every direction, the interstices being filled with lace-like ornament, so that the effect is like that of a fan. It is a peculiarly English kind of work: Henry VII.'s chapel at Westminster, King's

College, Cambridge, and St. George's Chapel, Windsor. It is peculiar to the late Perpendicular style.

FAN-TRACERY (ST. GEORGE'S CHAPEL, WINDSOR).

Farad, in *Electricity*, is the unit of electrical capacity. A condenser (q.v.) has that capacity when a charge of one coulomb of electricity brings it to a potential of one volt. Such a capacity is enormous, and a much smaller practical unit is therefore desirable. On this account the *microfarad* is used; it is the millionth part of a farad. [ELECTRICITY.]

Faraday, MICHAEL, F.R.S., the son of a Yorkshire blacksmith, was born at Newington, Surrey, in 1791. His early education was of the slightest, and he was a bookbinder's apprentice at the age of 20, when by chance he attended a course of Sir Humphry Davy's lectures at the Royal Institution. He took notes of what he heard and sent them to Davy, who at once engaged him as assistant. However, a kind of jealousy appears to have prevented the master from cordially helping on his able young *protégé*, and it was owing to his own exertions that Faraday in 1825 was made director of the laboratory, and in 1827 Fullerian Professor at the Institution, with which he was connected for more than half a century. As a chemist he is credited with many important discoveries, all of a more or less practical nature, such as the alloys of steel, the composition of glass for optical purposes, the compounds of chlorine and hydrogen with carbon, and of sulphuric acid with naphthaline. From 1830 he concentrated his energies chiefly on magnetic and electrical phenomena, and his discovery that an electrical current is producible from the revolution of a magnet has been fraught with marvellous influence on material progress. His researches covered the whole field of electromagnetism, and were full of suggestions worked out by later inquirers, the general tendency of his speculations pointing to the now established doctrine of the correlation of the physical forces. Faraday excelled also in the art of popularising science by the use of simple and clear language illustrated by striking experiments. Much of his work is recorded in the *Philosophical Transactions* and in scientific journals, but he produced three important treatises—viz. *Experimental Researches in Electricity*, *Fundamental Researches in Chemistry and Physics*, and *On the Various Forces in Nature*. In his private life he was singularly modest and happy. He scorned money-making, and was content with his small salary, to which a Civil List pension of £300 was added in 1835. A grant of rooms in Hampton Court Palace provided him with a home in his old age. Though married, he had no children. His religious views were somewhat eccentric, for he attached himself to the small sect of Sandemanians, to whom he preached every Sunday. Honours of all kinds were bestowed upon him by learned bodies at home and abroad, but he rather avoided than sought any personal distinction. Working up to the last, he died in 1867.

Farce (said to be from Latin *farcio*, to stuff), a short comic dramatic sketch, full of broadly ludicrous incident but without any very elaborate plot. The Italian mimes [COMEDY] are perhaps the earliest kind; but the farce proper first appears in mediæval French literature of the 14th and 15th centuries, probably as the direct successor of the fabliaux (q.v.). These farces are satires on various commonplace aspects of bourgeois life. Some were partly the basis of Molière's comedies. During the last two centuries farce has been a feature of the English stage: but tends now to be superseded by musical sketches after the type of the French vaudeville.

Farcy. The nodules which appear beneath the skin as the result of the invasion of the subcutaneous tissue by the bacillus of glanders are termed *farcy buds*. [GLANDERS.]

Farel, GUILLAUME, was born at Gap in France in 1489. He studied in Paris under Lefèvre d'Étaples, became a Protestant pastor, and after a long course of preaching in Dauphiné and Switzerland, settled at Geneva. He influenced Calvin to join him there, and assisted the great reformer in drawing up the Confession of Faith and disciplinary rules (1537). The next year they both were driven from their posts, and Farel took up his abode at Neufchâtel, where he died in 1565.

Faria y Sousa, MANUEL DE, born probably at Souto, Portugal, in 1590, and, early attached to the service of the Spanish Court, became secretary of the embassy at Rome in 1631, but retired at the end of three years to devote himself to literary labours in Madrid. His *History of Portugal* is a valuable work, and is supplemented by three other well-known compilations—*El Asia Portuguesa*, *La Europa Portuguesa*, and *El Africa Portuguesa*. He also produced a lengthy commentary on the *Lusiad*, and a volume of stilted poems entitled *Fuente de Aganippe*. He died in 1649.

Farini, CARLO LUIGI, was born at Russi in the Roman States in 1822, and educated at Bologna for the medical profession, in which he achieved some distinction. A moderate Radical, he was driven into exile in 1842, spending several years in France and England. In 1848 he came back, and

was returned as deputy for Faenza, acting first as Minister of Health and afterwards as Minister of the Interior in Piedmont. He vigorously seconded the policy of Cavour, and in 1859, being chosen Dictator at Modena, brought that state and Parma into union with Sardinia. In 1860 Cavour gave him the portfolio of Commerce, and in 1862–63 he was for a short time Premier, resigning through ill-health. He died in 1866. Mr. Gladstone, his personal friend, translated into English his chief work, *Il Stato Romano*.

Farm (A.-S. *feorm*, provisions, food), originally land let on hire for a rent in kind, which (in England during the 13th century in particular) gradually became commuted for a money payment. The term was extended to all kinds of letting, especially that of the right of collecting taxes. [Farmers-General.] It is sometimes, though probably erroneously, derived from the Low Latin *firma*, an agreement, which probably is itself derived from *feorm*. The peculiar history of land tenure in England has made "farmer" synonymous with capitalist-cultivator, so that in America it is applied to owners who cultivate their land.

Farmer, Hugh, born at Shrewsbury in 1714, attained eminence as a Nonconformist divine, and preached for many years at Salters' Hall, holding a pastorate office at Walthamstow. He wrote several curious treatises on *The Nature of Christ's Temptation*, *On Miracles*, and *On the Demoniacs of the New Testament*, provoking much controversy by adopting a somewhat Rationalistic tone. Retiring from the ministry about 1780, he died in 1787.

Farmer, Richard, born at Leicester in 1735, and educated at Cambridge, took holy orders, though his tastes were rather social and literary. In 1766 he produced his *Essay on the Learning of Shakespeare*, in which he displayed a great knowledge of Elizabethan literature, and demolished the theories of such worshippers of the bard as desired to attribute to him sound classical scholarship. He became master of his college (Emmanuel), Vice-Chancellor, and Prebendary successively of Lichfield, Canterbury, and St. Paul's, rendering himself famous in the latter capacity by introducing sculpture into the cathedral. With much good sense he twice declined a bishopric, and died at Cambridge in 1797.

Farmers-General, in France, before the Revolution, were large capitalists usually associated in firms or companies, who collected certain taxes, especially customs duties, the gabelle or salt tax, and the tax on tobacco, guaranteeing and often advancing a sum in return to the Treasury. Great abuses were naturally connected with this method of collection, which was abolished at the Revolution, and many of the profession were beheaded during the Reign of Terror.

Farming. [Agriculture.]

Farne or **Fern Islands,** The, also called the Staples, are 17 in number, and lie off Bamborough Head on the coast of Northumberland, from which they are 1¾ miles distant. On the largest of the group are two lighthouses. The wreck of the *Forfarshire*, in which Grace Darling (q.v.) immortalised herself, took place here in 1838. The remains of St. Cuthbert's Priory can still be traced on one of the rocks.

Farnese, the surname of an eminent Italian family, which rose into greatness from Farneto, near Orvieto, in the 13th century, and supplied one Pope to Rome and many princes and generals to minor states, besides encouraging the arts by lavish munificence. The Farnese Palace contains some of the finest works of antiquity, including the Farnese Hercules and the Farnese bull.

Farnese, Alessandro, was born at Carino, Italy, in 1468, and was elected to the Papal chair in 1534 as successor to Clement VII., under the title of Paul III. His tenure of office was marked by many important events. It was he who hurled a bull of excommunication against Henry VIII., and formulated another famous decree known as *In Cœnâ Domini*. He leagued himself with Charles V. and the Venetians against the Turks, brought about peace between France and Italy, aided to establish the Order of the Jesuits (1540), and convoked the Council of Trent (1542). A great patron of art, he summoned Michael Angelo to complete the construction of St. Peter's. His affection for his son, Pietro Luigi, a dissolute voluptuary, whom he made Duke of Parma, brought him into unpopularity, and provoked the hatred of Charles V. He died in 1549.

Farnese, Alessandro, great-grandson of the above, and third Duke of Parma, was born in 1546, succeeded his father Ottavio in 1586. He had already distinguished himself as a soldier at the battle of Lepanto (1571), and had been entrusted by Philip II. with the government of the Netherlands. In 1590 he was sent to raise the siege of Paris, and defeated Henry IV., whom he again worsted two years later before Rouen. At Caudebec, however, he was mortally wounded, and died at Arras in 1592, never having taken possession of his principality.

Farnworth, a township of Lancashire, on the Lancashire and Yorkshire Railway, 3 miles S.E. of Bolton. The chief manufactures are paper, cotton, iron, and bricks. The town has a public park of 11 acres.

Faröe or **Faröer Islands,** a group of 22 members in the Northern Ocean between Iceland and Shetland (lat. 61° 25′ to 62° 25′ N., long. 6° to 8° W.). They belong to Denmark, and have an area of 500 square miles, 17 of the number being inhabited. Though rising steeply to a height of two or three thousand feet, they are tolerably fertile, producing heavy crops of barley, turnips, and potatoes, and affording pasturage to thousands of sheep, but there is no timber. Immense flocks of sea-birds furnish feathers and eider-down for exportation, and fish is abundant on the coast. The chief of the group is Stromöe, on which is situated the capital, Thorshaven, the residence of the amtmann or governor. Coal, opals, and other valuable

minerals are found, especially in Süderöe. The Danes and other Scandinavian navigators draw their meridian through this spot. England occupied the islands from 1807 until the peace of 1814. The present inhabitants of the archipelago are almost exclusively of Norwegian origin, and the *Färiska*, or current speech, is a Norse dialect, while the official language is Danish. The natives are mostly descended from fugitives and sea-rovers, who arrived in the 9th century, and, like them, are still distinguished by their tall, muscular frames, physical strength, and longevity. Notwithstanding a severe and even stern outward expression, in harmony with their rugged environment, they are extremely kind-hearted and hospitable. They are occupied chiefly with fishing and pasturage, and the fine fleece of their flocks yields the raw material for a lucrative home industry.

Farquhar, GEORGE, born at Londonderry in 1678, and educated at Trinity College, Dublin, took to the stage very early, but abandoned it, owing to an accident by which he inflicted a mortal wound on a brother actor. Coming to London, he got a commission in Lord Orrery's regiment, but combined with soldiering the composition of sprightly, though licentious, comedies. His first piece, *Love in a Bottle*, appeared in 1698, and was followed by *The Constant Couple*, *Sir Harry Wildair*, *The Stage Coach*, *The Inconstant*, *The Recruiting Officer*, and *The Beaux' Stratagem*. The last, though written at a period of mortal sickness, is undoubtedly his masterpiece, and has kept the stage until the present day. He had a remarkable talent for the drama, and his plays are full of vivacity and light humour. Unhappily, just as he was on the verge of success, his health broke down mainly through struggles against poverty and the growing cares of a family. He died in 1707, leaving two daughters whom he commended in a touching letter to his friend, Wilks.

Farragut, DAVID GLASGOW, an American of Spanish blood, was born at Knoxville, Tennessee, in 1801, and, entering the United States navy, rose to the rank of captain in 1855. When the Civil War broke out he declared for the North, and received command of the naval expedition against New Orleans in 1863. He forced his way past the batteries that guarded the mouth of the river, destroyed the Confederate fleet, and captured the city. Operating from this base, he succeeded in the course of a few months in making himself master of the whole of the Mississippi. In 1864 he defeated the Confederates again in Mobile Bay, silenced the forts, and put an end to blockade-running. For these services he received the rank of admiral, hitherto unknown in the United States, and his statue was set up at Washington and New York. He died in 1870.

Farrar, THE VEN. FREDERIC WILLIAM, D.D., F.R.S., Archdeacon of Westminster, was born at Bombay in 1831. He received his early education at King William's College, Isle of Man, and King's College, London, passing thence to Trinity College, Cambridge, as a graduate and scholar of the University of London. After a distinguished academical career he was ordained in 1854, and became a master at Harrow under Dr. Vaughan and Dr. Butler. In 1871 he was elected head-master of Marlborough College, and held that post with credit till his appointment as Canon of Westminster and Rector of St. Margaret's in 1876. He was made Archdeacon in 1883 and Chaplain to the House of Commons in 1890. As a Churchman his sympathies have been broad, with a tinge of evangelical feeling, but he neither has founded nor attached himself to any school, and his great work has been to popularise theology and religious history. He first essayed literature as a writer of stories of public school life, and produced *Eric*, *Julian Home*, and *St. Winifred's*. The science of language for a time occupied his attention, and several philological works followed on his romances. In 1874 appeared his *Life of Christ*, by far his most striking achievement, and this was succeeded by *The Life and Works of St. Paul* in 1879, and *The Early Days of Christianity* in 1882. His *Eternal Hope* (1877), in which he argued against the existence of Eternal Punishment, caused a considerable sensation. As a preacher his reputation stands deservedly high, and his ephemeral writings are full of point and brilliancy.

Farrier (Fr. *ferrier*, from Latin *ferrum*, iron), a shoer of horses, who, before the development of veterinary surgery, was often also a horse doctor.

Fars, or FARSISTAN, a province of Persia extending over some 55,000 square miles, on the E. coast of the Persian Gulf, whence it stretches up to an elevation of nearly 3,000 feet, embracing part also of the sandy plateau beyond with the saline lake of Bakhtegan. The valleys of the intermediate region are picturesque and fertile, producing tobacco, wine, rice, dates, cotton, cochineal, and roses for the manufacture of ottar. Borax and naphtha are found in the plains, and the hills contain iron and lead, marble and alabaster. The rivers Nabon and Tab (ancient Arosis) flow into the Persian Gulf, and the Bundemeer (ancient Araxis) feeds the lake of Bakhtegan. Shiraz, Darab, Babahan, and Bushire are the chief towns. Near the former stand the ruins of Persepolis and its sculptured rocks, and the remains of Shahpur lie to the north-west.

Farthing (A.S. *feordh*, fourth), the fourth part of a penny, the smallest English coin; also the name of the fourth part of a noble (q.v.).

Faruckabad, a district and city in the Doab, N.W. Provinces, British India. The former has an area of 1,909 square miles, of which only a small portion lies outside the Doab. The soil is rich, and produces cotton, indigo, tobacco, etc. The city is well-built and salubrious, standing on the right bank of the Ganges, and connected by rail with Calcutta and Delhi. Its name signifies "City of Happiness," and is not wholly undeserved, though the prosperity of the place as a commercial centre has not increased of late years. Holkar was defeated here in 1805 by the British under Lord Lake.

Fasces, in ancient Rome, were twigs of birch or elm bound together in a bundle, and containing an axe, the head of which projected from them. They were carried by lictors (q.v.) before the consuls, prætors, dictator, and master of the horse, and in the provinces before the quæstors. When a general had been "saluted as imperator" by his soldiers in consequence of a victory, his fasces were wreathed with laurel. Probably they were of Etruscan origin, and they were carried before the Roman kings.

FASCES.

Fascination, the paralysing influence said to be exerted by some serpents over their prey. The evidence in support of this influence is very slight; if it does exist, it probably arises from inherited fear on the part of the victims. The behaviour of snakes in captivity towards their prey lends no support to the theory of fascination. Dr. Martin Duncan says, "The affection of birds for their young which causes them to flit about the nest and be destroyed with their little ones is usually but erroneously taken for fascination on the part of the snake. In fact, an analysis of any given instance of fascination shows it to be supposititious."

Fascioles, the bands of small tubercles on the tests of most of the sea-urchins of the order Spatangoidea. The classification of this order is mainly based upon their presence and arrangement.

Fasti, in ancient Rome, strictly the "lawful days" (*fas*, divine law) on which legal or other business might be done. The succession of these days was long the secret of certain orders of priests, those for the current month *only* being announced each month by the pontifices. Eventually, however, one Caius Flavius, a scribe of Appius Claudius Cæcus, got hold of the sacred books and published the list. Hence lists of such days were called *fasti*, and were naturally extended to include anniversaries of notable events, dates of the rising or setting of certain stars, short explanations of some festivals, and other matters such as are contained in a modern almanac. Several inscriptions with such lists have come down to us. Ovid's *Fasti*, of which only six books exist, are a poetical explanation of the Roman calendar as reformed by Julius Cæsar. These lists were the *fasti sacri*, while the *fasti annales*, or *historici*, were short lists of the chief magistrates for each year, and of the various notable events in it. Fragments of some of these are also preserved.

Fasting, prolonged abstinenee from food and drink. or, as in modern Christian fasting, from certain kinds of food. Such prolonged abstinences are often practised at certain times of life (especially at the beginning of manhood) by various savage races: perhaps originally because abstinence is favourable to the production of hallucination or "seeing spirits." But as moral ideas arise, the notions of self-discipline and self-sacrifice become dominant, and the fast a natural preparation for and counterbalance to the feast. Among Hindus and Mohammedans [RAMADAN] fasting is an important religious observance. It was so at Nineveh and Babylon, in ancient Egypt (in the mysteries of Isis and Osiris), and to some extent in the Hellenic and Roman religions. The Hebrew race had one annual fast prescribed to them by the Law (Leviticus xvi. 29, 34), but the zeal of later days multiplied occasions of fasting, and the practice is frequently alluded to in the Gospels. Though there is no express Scriptural command on the subject, fasting has from the first been an ordinary Christian observance. The Greek Church is very strict, both as to the length and the severity of its fasts. The Roman Catholic Church lays down precise rules, the Anglican appoints certain days but leaves considerable freedom, and though the Presbyterian Church of Scotland recognises fast days, the practice is generally omitted in Protestant churches. Two of the *Tracts for the Times* by Dr. Pusey contended for its revival, which has become very general among the High Church party during the last half century. There has been much controversy as to its value as a spiritual discipline.

Fastolf, SIR JOHN, is one of those historical characters that have been cruelly misrepresented in literature. Shakespeare chose to transform him, as Falstaff, into a swaggering, disreputable, broken-down soldier of fortune; but he was in reality one of the most capable and successful warriors of his age. Born about 1378 of a good Norfolk family, he entered the service of the Duke of Clarence, with whom he went to Ireland. He next joined Henry V.'s expedition into France, took the town of Meulent, was knighted, and received the companionship of the Garter. His retreat at Patay was falsely ascribed by Monstrelet to cowardice, and this may have led the great dramatist astray. In reality the conduct of Fastolf appears to have been highly commendable, and he remained in the public service until 1440. He then retired to his estates near Caister, in Norfolk, and the references to him in the "Paston" Letters and other records show that he was a remarkably wealthy man. Some attempt was made to implicate him in Cade's insurrection, very likely with a view to extorting blackmail, but he escaped this attack, and, dying at a good old age, in 1459, was buried in the Abbey of St. Bemute, Norwich.

Fata Morgana, an optical phenomenon seen in the straits of Messina. The observer facing the sea of Reggio, standing at a fair elevation with his back to the sun, will see reflected from the smooth surface of the sea a multitude of clearly defined pilasters, towers, and castles, armies of men on foot and horse, and many other multiplied images of objects existent on shore. The phenomenon requires for its manifestation a calm surface of the sea, a full and swelling tide in the centre of the channel, and a certain altitude of the sun. Special conditions of the air above may cause the

production of aërial images, and may fringe the objects with delicate edgings of the prismatic colours. Similar effects have been observed at Hastings; and on the great sandy plains of Persia, Tartary, Egypt, or Mexico, the *mirage* (q.v.) is well known. *Fata* in Italian = fairy; *Morgana* in Celtic legend is the sister of King Arthur, an enchantress living in the island of Tir Tairngire, the land of perpetual day, though enveloped in a magic bank of cloud.

Fate (Latin *fari*, to speak), etymologically a dictum or decree of the gods; but the term commonly means a force, determining the ultimate order of events, which man is powerless to resist. Very possibly this notion is originally a mythological embodiment of the "Uniformity of Nature" or Law of Universal Causation, considered as determining events and overriding the human will. As, however, the chaos of independent and conflicting deities becomes more organised in popular belief, and the conception emerges of one supreme over the rest, this law is identified with the decrees of the supreme Deity. In Greek mythology fate (*Moira*, *Eimarmenè*, "that which is portioned out") is sometimes the decree of Zeus, more commonly a destiny overriding both the gods and human affairs in the main, though with some variations. Thus (in Homer) men sometimes by their own sins suffer more than was originally appointed for them, while (in Herodotus, i. 91) Crœsus (we are told) was fated to suffer, but because he had made offerings to Apollo, that god postponed the date of his downfall for three years, but explained through his oracle at Delphi that "even a god cannot escape the destiny appointed." In Æschylus, the conception of a supreme overruling destiny predominates. Sophocles tends to identify destiny with the will of Zeus. Both notions are traceable in the Homeric poems. But the conception was naturally personified. Homer sometimes speaks of one Moira, sometimes several, calling them also Klōthes ("the spinners") who begin to spin a man's fate at his birth. In the Theogony attributed to Hesiod, the fates (Moirai) are described as the daughters of Zeus and Themis, and sisters of the Hours, or as the daughters of Night and sisters of the Keres, the goddesses of death. They are three: Lachesis, presiding over the past; Clotho, over the present; Atropos, over the future. Clotho is depicted with a spindle, Lachesis with a scroll or globe, Atropos with scales or with shears (to cut the thread) or sometimes drawing a lot. These Moirai were eventually identified with the far less definitely personal Roman Parcæ.

The conception of Fate was taken up on its philosophical side by Herodotus and identified with the reason or natural law of the universe. Democritus denied its existence; and these rival views appear in the Stoic and Epicurean school respectively. Christian thought has taken up the notion of fate as the will of God, in Predestination (q.v.), and the conception appears in the orthodox creed of Mohammedanism. that all things happen by God's will, and it is idle for man to try to evade his destiny. The Shiah sect of Mohammedans tend to a free-will theory. Modern scientific thought, by refusing to abstract natural laws from phenomena, and treating them not as real entities determining events, but as our formulæ expressing the order in which events happen, has eliminated most of the fatalist element from philosophic theory. But it cannot be said to have as yet satisfactorily explained the conception of moral responsibility. [FREE-WILL.] Kant regards both the belief in necessity (the scientific form of fatalism) and that in freewill as unavoidable by the human reason, but irreconcilable owing to its limitations.

Fatehgark is the fort or military station connected with Faruckabad. It lies on the opposite side of the Ganges, and is chiefly known for the unhappy events which occurred there during the Indian Mutiny (1857) when a number of English refugees were besieged in the cantonments.

Fatehpur (City of Victory), a city in the Doab, N.W. Provinces, British India, situated on the railway between Calcutta and Delhi, 70 miles N. of Allahabad, and 50 miles S. of Cawnpore. It has some business importance, but is chiefly remarkable as the administrative centre of the district to which it gives its name. The latter has an area of 1,583 square miles, bounded on the one side by the Ganges and on the other by the Jumna. A branch of the Ganges Canal also provides means of communication and irrigation. The fertile alluvial soil yields the usual Indian crops, especially cotton, in abundance.

Father Lasher, a popular name for *Cottus scorpio* (also called the sea scorpion) and *C. bubalis*, small fishes common on the European coasts. [BULLHEAD.] The head is large, and the pectoral fins antler-like and set with spines; the general coloration is dark, with grey markings. The males are said to build a kind of nest for the spawn, and to defend the young with great fierceness.

Fathers are those eminent Christian teachers of the earlier centuries who have exercised a distinct influence in formulating and developing the doctrine of the Church. The *Apostolic Fathers* are those disciples and contemporaries of the Apostles whose works still remain to us; viz. Clement of Rome, Polycarp, Ignatius, the authors of the Epistles of Barnabas, the *Pastor* (attributed to Hermas) and the *Epistle to Diognetus*, and Papias. Of later Fathers the most eminent were:—*Greek fathers:* Justin Martyr, Irenæus, Clement of Alexandria, Origen, Athanasius, Eusebius, Gregory of Nazianzum, Chrysostom, Cyril of Alexandria, Socrates, and Sozomen, the ecclesiastical historians. *Latin fathers:* Tertullian, Cyprian, Lactantius, Ambrose, Jerome, Augustine. Roman Catholic writers enumerate as necessary qualifications for the title of Father (1) sufficient antiquity (the period is commonly extended to the twelfth or thirteenth century, so as to include Aquinas); (2) orthodoxy; (3) sanctity of life; (4) approbation by the Church. These qualifications, however, are not absolute, since the views of (*e.g.*) Origen and Eusebius were in some degree regarded as

heretical, and Tertullian was actually a Montanist (q.v.). Non-Roman Catholics writers commonly close the list of the Fathers with Gregory the Great (died 604) and John of Damascus (died 754). Though the writings of the Fathers differ much in points of doctrine and in authority, yet as they represent early and, therefore, very valuable tradition, great weight is assigned by theologians to their statements of doctrine, especially when common to several Fathers; but the estimate of their value varies greatly, being least usually among ultra-Protestant theologians. "Patristics," or the study of their writings, is a special branch of theology, revived in the Anglican Church by the Tractarians (q.v.). Jacobson's edition of some of the Apostolic Fathers, and the forty-three volumes of translations edited by Pusey, Keble, and Newman, may be mentioned among the numerous collections and editions.

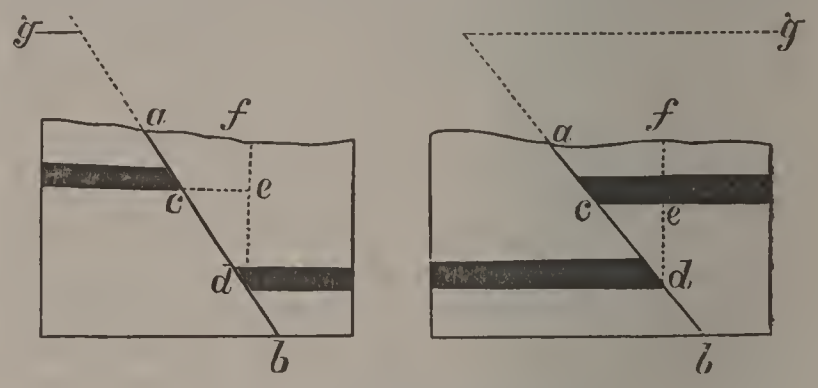
Fathom (A.-S. *fædhm*, the space reached by the two arms outstretched, that being an easy measure of lengths of sounding-line), a measure of six feet, principally used in sounding depths of water.

Fatty Compounds. The carbon, or organic compounds, are usually divided into two classes—the *aromatic* (q.v.) and the *fatty*. The latter are characterised, with a few exceptions, by a straight-chain arrangement of their carbon atoms, and are hence called also the *straight-chain* compounds. They comprise an almost unlimited number of substances of all varieties of type, as alcohols, acids, ketones, aldehydes, etc. One series of acids were primarily known as the *fatty acids*, owing to the occurrence of some members of series in natural fats and oils (*e.g.* palmitic, stearic acids, etc.). From these the name of fatty compounds were taken. The compounds are divided into *saturated* and *unsaturated*. The former may be regarded as derivatives of the group of hydrocarbons known as the *paraffins* (q.v.), which have the general formula C_nH_{2n+2}, while the unsaturated compounds are derived from hydrocarbon containing less hydrogen as the *olefines* (C_nH_{2n}), *acetylenes* (C_nH_{2n-2}), etc.

Fatwa, a town of Bengal, at the confluence of the Punpan and the Ganges, upon the East Indian Railway, eight miles from Patna. Many pilgrims visit it for the sake of bathing in the sacred river.

Faucher, Léon (1803–1854), a French statesman and writer, was born at Limoges. He first turned his attention to archæology and physiology, but the Revolution of 1830 drove him into journalism and politics. Between the years 1830 and 1842 he edited at different times the *Temps*, the *Constitutionnel*, and the *Courrier Français*. In 1843 he wrote for the *Revue des Deux Mondes* some articles on English industries, which were afterwards collected as *Études sur l'Angleterre*. After the Revolution of 1848 he sat for the department of Marne under the Presidentship of Louis Napoleon, and became successively Minister of Public Works and Minister of the Interior, but he resigned when Napoleon became Emperor.

Fault, in *Mining* and *Geology*, means the fracture of a stratum of rock, or of a series of strata, accompanied by dislocation. Miners sometimes call a fault a "heave" or "trouble," or term it an "upthrow" or a "downthrow fault," according as the bed in which they have been working is carried to a higher or to a lower level, the same fault being known by either name according to the direction from which it is approached. In geology the term *upthrow* is applied to that side of the fault on which the beds are higher, and *downthrow* to the other side, although the actual movement of the broken strata may have been upward, downward, or both. The line of fracture, or *hade* (*a b*), is sometimes vertical, coinciding with the *throw*, but generally it is inclined. In this case it usually dips or *hades* downwards towards the downthrow side of the fault, and faults in which this is the case are termed *normal*. A fault which hades towards the upthrow is termed *reversed*. In the case of a normal fault affecting horizontal strata the same bed cannot be pierced twice by a vertical shaft as



FAULT.
1, Normal fault; 2, reversed fault.

it may be in the case of a reversed fault. The actual displacement of one part of a bed by a fault with reference to the other part, measured along the hade, is called the *heave* (*c d*), and may be resolved, like any other oblique movement, into an apparent vertical displacement and an apparent lateral displacement. The latter of these apparent movements is termed the *width* (*c e*) of the fault; the former is termed the *throw* (*c d*), and is the more readily ascertained. It may amount to thousands of feet. It is, however, remarkable that the great mass of rock uplifted above the general surface in such cases (*g a*) has commonly been so planed down by denudation that faults on a gigantic scale may make no difference in the surface levels. On a small scale faults may be sharply-defined lines; but even then the harder parts of the fractured surfaces will generally be polished into what are called *slickensides*. More often the broken ends of rock are bent or crushed, the line of fault being sometimes occupied by a cemented breccia known as *fault-rock*, which may be yards in thickness. The general direction of a fault along the surface, indicated by a white line on the maps of the Geological Survey, is termed its *strike*. Faults, being fractures that have commonly resulted from the giving of rocks under similar strains to those which have folded or inclined them, often coincide either with the dip (q.v.) or strike (q.v.) of the beds — *i.e.* they are either parallel to, or at right angles to, the main folds, and are accordingly known as *dip-faults* or *strike-faults*. In place of a single fault we sometimes

find a succession of parallel faults close to one another, each throwing the beds a little farther apart. These are called *step-faults*. Two normal faults hading in opposite directions produce what is known as a *trough-fault*. Faults are of the greatest importance in mining, since they often seriously interrupt the continuity of seams of coal or of mineral veins. They sometimes serve as pre-existing fissures to direct the intrusion of igneous dykes, or to become lined with mineral ores, and so converted into veins. Interrupting the underground drainage, they are often marked by a line of springs, either at the surface or deep-seated, as in that at Burton-on-Trent, which intercepts the gypsum-charged waters from Needwood Forest and supplies the deep wells of the Burton breweries. Bringing rocks of entirely different characters together, they are often marked by abrupt change in scenery, as in the two great faults which cross Scotland. One of these runs from Loch Lomond to near Stonehaven, over 120 miles, with a throw of several thousand feet, bringing the crystalline Archæan rocks of the Highlands against the Old Red Sandstone, and tilting the latter on end for a thickness, or breadth of outcrop, of 2 miles. This forms the "Highland line" of Strathmore. The other fault runs from Dunbar to Girvan, with a throw that amounts in some places to 15,000 feet, and produces a contrast of scenery almost as marked as that of the Highland line.

Fauna, a collective name for the animals indigenous to a country or region, or of a particular geological period. The term is also applied to a treatise on either of these subjects.

Fauns (Latin *favere*, to favour, *i.e.* well-wishers) were Roman nature-deities attendant on the god Faunus, eventually identified with the Greek *Pan*. They are represented as half-men, half-goats, with small horns. They were frolicsome, mischievous sprites, who sometimes sent nightmare. Faunus himself was the god of fertility, and revealed the future in dreams. He had a wife Fania, and was identified by chroniclers with an early and mythical king of Latium.

Fauntleroy, Henry (1785–1824), an English banker, who was hanged for forgery. At 15 years of age he entered the bank of Marshall, Sibald and Co., and in 1807 he became a partner at the death of his father, also a partner. In 1824 it was discovered that the signatures of two trustees had been forged for the transfer of £1,000 stock, and that Fauntleroy had been paying the dividends upon it for four years. Further search discovered other like transactions, and Fauntleroy was indicted upon seven counts. He was hanged at Newgate.

Fauriel, Claude Charles (1772–1844), a French writer and critic, was born at St. Étienne, and educated at Lyons. He took part in the Revolution, and served for one year in the army under the celebrated Tour d'Auvergne. He then became secretary (1800) to Fouché, the Minister of Police, but, being opposed to the idea of a despotism, resigned in 1802. He turned his thoughts to literature and languages. In 1810 he translated some works of a Danish poet and, shortly afterwards, tragedies of Manzoni. In 1824–25 he published *Popular Songs of Modern Greece* with translation and annotations. This was during the struggle for liberty in Greece, and his work attracted much notice. The Revolution of 1830 gave him the chair of Foreign Literature at Paris. In 1836 he wrote a history of *Southern Gaul under its German Conquerors*, and he collaborated in a *Literary History of France*. He also published, with introduction and translation, a Provençal poem, which gave a history of the crusade against the Albigenses. After his death were published his *History of Provençal Poetry* (1846), and *Dante and the Origin of Italian Literature* (1854). He was on terms of friendship with Madame de Staël, Condorcet, and other noted people of his time.

Faust, a famous magician, the hero of a well-known folk-story, which has formed the foundation of puppet-plays, dramas, operas, and of Goethe's celebrated philosophic poem, the several authors enlarging or otherwise altering the original legend as suited their purpose. It is said that there was a real Faustus in the 16th century, who gave himself out to be endowed with supernatural powers, and this statement seems to be supported by valid proofs. But the hero of the legend, who sold himself to the Devil, either for the means of gratifying his passions, or for increase of knowledge, is, of course, a mythical being. The story in its present form is said to date from the dawn of the New Learning and the Reformation. This conclusion is based on the gibes at the Franciscans, and the practical jokes Faust is said to have played on high ecclesiastical dignitaries at Rome. But such gibes are by no means a safe guide, for they occur in English literature of the 14th century, and are common enough at the present day in the folk-tales of countries where the Roman faith is supreme. The Faust-legend apparently first took literary form in a German chap-book published towards the end of the 16th century, and republished over and over again. An edition dated 1846 is entitled *The Profligate Life and Terrible Death of Dr. Johannes Faust, the Arch-Necromancer*. The preface is a mere adaptation of that of the original book, and the editor assures his readers that his purpose is not to tempt men to evil lives, but to warn them of the sad consequences of commerce with the Evil One, just as in the Scriptures the lives of wicked men are recounted as examples to warn us. The book is divided into three parts, and the narrative is interspersed with moral reflections.

The first part opens with an account of Faust's birth, of "poor but honest parents." He prosecuted his studies with success, and took his doctor's degree; but his profligate habits brought him to poverty, and he turned to magic as a means of replenishing his purse. At last he resolved to raise the Devil, and this he did in a wood near Wittenberg. The operation was conducted in the following fashion:—At midnight, in the spot selected, Faust traced three concentric circles on the ground, and, having denied God, invoked the Devil three

times. Almost immediately a ball of fire ran round the circle, with a noise like the discharge of a park of artillery, and Faust was terribly frightened. But he plucked up courage, and tried another, and still another more potent charm, and at last Satan himself appeared, and asked why he had been summoned. (The folk-story does not give the

FAUST RAISING THE DEVIL. (*From a German chap-book.*)

formula of invocation, but this will be found in Marlowe's play of *Dr. Faustus.*) Faust told him; and the Devil, having offered to serve him, conditionally, he was conjured to come to Faust's dwelling in the morning to arrange conditions. These were that Faust should deny God and every thing good, and then he was promised for the space of twenty-four years the means of indulgence in every earthly pleasure. Faust agreed, and with his own blood signed a compact embodying these conditions. The Devil thereupon appointed Mephistopheles (q.v.) to be Faust's servant and familiar, and with this spirit the Doctor was wont to inquire about spirits, heaven, the angels, and once he asked his familiar if the devils would be saved. In reply Mephistopheles quoted St. Paul (Romans xi. 32), as affording them strong ground of hope. Then they discoursed of hell. The remainder of the first book is taken up with an account of Faust's skill as an astrologer and seer, his luxurious mode of living; how he carried three students to Munich on his cloak, rode out of the wine-cellar at Auerbach on a cask; and raised up Menelaus, Achilles, and other heroes for the gratification of some students. Mixed with these adventures is a series of coarse practical jokes, some of which find a place in the low comedy scenes of Marlowe's *Dr. Faustus.*

The second book opens with the story of Faust's half-hearted repentance. The Devil, however, appeared to him and terrified him into signing a second compact. Then Faust engaged Wagner as his amanuensis. The chief incidents in this book are the aërial hunt which Faust showed Cardinal Campeggio, "foxes and hares running in the sky, Mephistopheles mounted, and in hot pursuit, whilst Faust blowing a huntsman's horn, brought up the rear"; the raising of Alexander the Great and his consort, the procuring ripe fruit in winter, the magical concourse of singing birds, the building a castle and banqueting hall, the raising a dead man to life, and Faust's *liaison* with Helen of Troy, by whom a son was born to him.

In the third book we see the end approaching. Faust has made his will, leaving all his property to Wagner, and charging him to write a full account of his master's adventures, which was not to be made public till after Faust's death. Soon after this the Devil appeared to Faust, telling him the end was near. Wagner tried to comfort him, and to induce him to send for a clergyman. At last Faust did so, and the good man comforted him, and advised him not to argue with the Devil, but to bid him begone. Faust promised to follow this advice, but when the Devil appeared, and began to dispute, Faust answered him, and, as might be expected, got the worst of the argument. Then he tried to commit suicide, "but invisible hands took the knife away from him," and soon after he died in his chamber without a friend near him. "And when they entered the room they saw that the walls and the table and the chairs were covered with blood; for the Devil had dashed him first against one side of the room and then against the other."

Marlowe followed the folk-story pretty closely: and his Faust is a man; the Faust of Goethe's poem is an abstraction, and from the "Prologue in Heaven" one gathers that the German poet intended his Faust to be a second Job, and believed with Longfellow that Lucifer is God's minister. Marlowe's Faustus, according to Lamb, was "busied in speculations that are the rottenest part of the core of the fruit that fell from the tree of knowledge;" Goethe's Faust wants to know the "causes of things" (cf. Verg. *Georg.* ii. 490). Commentaries almost numberless have been written on this poem, yet it should be its own interpreter, and will reveal its meaning to the man who diligently studies it.

The idea of a compact between man and the Devil dates from early Christian times; and it was the belief of some of the Fathers that a knowledge of magic and alchemy was imparted to man by the fallen angels, and "all that miserable knowledge which is of no use to the soul" was ascribed to the same source.

Faustina, (1) ANNA GALERIA, wife of Antoninus Pius. d. 141; (2) called FAUSTINA JUNIOR, to distinguish her from the former, was the wife of Marcus Aurelius, the philosopher. Both these ladies have been credited with great profligacy of life, but these stories are doubtful, and in any case they seem to have enjoyed the full esteem and affection of their husbands.

Fauvette. [WARBLER.]

Favart, CHARLES SIMON (1710–1792), a French dramatist, born at Paris. His first work to be performed was *La Chercheuse d'Esprit* (1741). In 1745 he became director of the Opéra Comique, and managed to offend other theatres, whose jealousy

raised many obstacles in his path. Another noted play of his was *Le Coq du Village*. He is looked on as the creator of French serio-comic opera, and his works were collected into 10 volumes in 1810. In 1809 his *Mémoires et Correspondence* was published.

Faversham, a municipal borough and port of North Kent, upon the river Swale, 52 miles S.E. of London and 10 miles N.W. of Canterbury. It consists mainly of four streets with a market-place in the centre. The creek upon which it is situated admits vessels of 200 tons, and there is a trade in corn, hops, fruit, and wool. The oyster cultivation of Faversham is renowned, and there are manufactures of powder and of Roman cement in the neighbourhood. There is a fine cruciform church, which contains the supposed tomb of King Stephen, and there are schools, a literary institute, and a reading-room. Some ruins remain of a Cluniac abbey, founded in 1147; and James II. embarked here after his abdication.

Favositidæ, an extinct family of corals belonging to the Perforata (q.v.), which lived only in Palæozoic (q.v.) times.

Favre, Jules Claude (1809–1880), a French statesman, was born at Lyons. He studied law at Paris, and was admitted to the bar. He was an advocate of republicanism, and took part in the Revolution of 1830, and again in that of 1848. He was elected deputy for the department of Loire, and became a member of the Committee on Foreign Affairs. He led the Mountain (q.v.) against Louis Napoleon after the *coup d'état*, and then retired from politics and practised law. In 1858 he defended Orsini when on his trial for an attempt to kill the Emperor. He again entered the Legislature as member for Paris, and headed the Republican party. On the downfall of the Empire he was appointed (1870) Minister of Foreign Affairs; and his neglect or mistake in 1871, in permitting the Paris National Guard to retain its arms, gave opportunity for the Communistic outbreak, and in his negotiations with Bismarck he failed to include General Bourbaki's army in the conditions. These and minor mistakes led to his retirement, and he returned to his practice of the law. He was a good and effective speaker. He was elected to the Academy in 1867.

Favus, a skin disease produced by the growth of a fungus known as the *achorion schönleinii*. The disease usually affects the scalp, and produces yellow, irregular crusts, and leads to the falling off of the hair. It is more frequently met with in children than in adults, and is rare in England, but not uncommon in Scotland. Treatment consists in poulticing and washing the affected parts, and when cleanliness is secured in applying remedies to kill the parasite.

Fawcett, Henry (1833–1884), an English minister and writer upon political economy and social subjects. His father was a magistrate of Salisbury. Mr. Fawcett was educated at King's College School, London, and at Trinity Hall, Cambridge, of which society he became a fellow after graduating as 7th wrangler in 1856. In 1858 an accident, while he was out partridge shooting, led to the total loss of sight. With characteristic determination and strength of mind, Mr. Fawcett forwent few if any of his accustomed recreations and occupations; he rowed, rode, and skated almost to the end of his life, and remained as useful a member of society as he had been before the accident. He wrote many articles in magazines upon politics and upon political economy, and his *Manual of Political Economy* led many to study the subject who had found earlier manuals too technical and abstruse. In 1863 he was appointed Professor of Economy at Cambridge. He wrote many works upon that and kindred subjects, receiving much valuable aid from his gifted wife. After three vain attempts to enter Parliament, he was returned for Brighton in 1865 and again in 1868, and for Hackney in 1874. In 1880 he was made Postmaster-General, and his period of office was marked by the establishment of the parcel-post, the reply-postcard, and by other improvements in different departments. While in Parliament he devoted much attention to Indian questions; and it was probably only his blindness that prevented his admission to the Cabinet. A life of him has been written by Mr. Leslie Stephen. His wife, Millicent Garrett Fawcett, is the daughter of Mr. Newson Garrett; she was married in 1867, and, as has been stated above, largely assisted her husband in his pursuits and occupations. She published a work on *Political Economy for Beginners*, in 1869, consisting of a compendium of the *Manual* of Professor Fawcett. She is a strong upholder of Women's Rights, and has lectured much in favour of the extension of the suffrage to women.

Fawkes, Guy (1570–1606), was born at York. Though brought up an Anglican, he became a Roman Catholic through the influence of his stepfather, who was of that faith. For some time he served as a soldier of fortune in Flanders and elsewhere, and seems to have been a man of good parts and qualities. His part in the plot of Catesby and others to destroy the king, James I., and Parliament, in which the critical operation of "belling the cat" fell to his lot, is a matter of well-known history, as is its failure and direful results to the conspirators.

Fay, Andras (1786–1864), a Hungarian author and poet, was born at Kohany, and was educated to the law. Ill-health compelled him to quit that profession and take to literature. In 1820 he published a collection of *Fables*, which gained for him the name of the "Hungarian Æsop." He had already published a *Nosegay* in 1807 and a *Fresh Nosegay* in 1818, and among his works are many other tales, plays, and romances. In 1835 he represented Pesth in the Hungarian Diet. He is the founder of the Hungarian National Theatre.

Fayyum, a province in the N. part of Central Egypt, separated by mountains from the Libyan desert. The area is 500 square miles, of mostly alluvial formation, and, in the north, generally fertile. The west is now covered with sand, and

contains the lake Birket-el-Karun. There are irrigation canals, but these are not fully used, and the province languishes. Rice, barley, rye, and flax are the principal objects of cultivation, and there are cotton factories, while the linen of Fayyum enjoys great renown. Caravans go from the province to Cairo, carrying shawls, linen, otto, dates, etc. The chief town is Medinet-el-Fayyum.

Fear, CAPE, the southern point of South Carolina, is situated at the southern extremity of Smith's Island, on Cape Fear river, at the mouth of which is a lighthouse, with a light fixed at the height of 110 feet. The river runs S.E., with a course of 250 miles, and is navigable for steamboats for half that distance.

Feathers, the distinctive covering of Birds (q.v.), developed like the hair of Mammals and the scales of Reptiles and Fishes as outgrowths from the skin. Those which determine the shape of a bird are called contour-feathers or *pennæ*, but except in the ostrich (q.v.) and its close allies, the

CONTOUR-FEATHER OF THE ARGUS PHEASANT.

a, Shaft or rachis, with barbs on one side removed to show aftershaft or hyporachis *b*, from which the barbs on the opposite side have also been removed; *c c*, barbs; *c'*, barbs separated to show barbules; *d*, quill.

Penguins, and a few other birds, these are not distributed evenly over the body, but in patches called *pterylæ*, and between these the skin is either bare or covered with down, and these interspaces are called *apteria*. In many birds powder-down patches occur; these are tracts covered with small down feathers, giving off a white or bluish dust, the origin of which is not satisfactorily established (Nitzsch: *Pterylography*). Feathers are of various kinds: the most important are the contour-feathers, consisting of a main shaft or stem, divided into the true shaft or *rachis* (*a*), and the quill or *calamus* (*d*). From the former radiate the barbs or *rami* or *radii* (*c c*), and these, with the true shaft, form the vane or *vexillum*. The spaces between the barbs are filled by the barbules (*c'*), which bear the same relation to the barbs that these bear to the main stem. Generally speaking, the ends of the barbules are hooked, so that those springing from one side of the barb interlock with those of the barb next above or below, and it is to this arrangement that the web-like structure of each side of the vane is due. Barbules, however, do not occur in any of the feathers of the Cursorial Birds, and only in the contour-feathers of other birds. In many feathers there is an accessory vane, called the aftershaft or *hyporachis* (*b*) springing from the under side, near where the quill passes into the true stem. This aftershaft may be as long as the vane, though it is generally much smaller, or it may be reduced to a mere downy tuft. When the barbs are soft and free, the feathers are called plumes (*pennoplumæ*), or down feathers (*plumulæ*), according as the shaft is largely developed or not. A feather with a long shaft and small vane is called a *filoplume*.

Feathers are developed within sacs from the surface of conical dermal papillæ, by a process that Professor Huxley compares to casting in a mould, and appear first as embryonic down-feathers, which are soon replaced by the permanent feathers formed in a similar way. The life of a feather is generally only a year, when the nutrient pulp in the quill decays, and the feather dies and is shed. This process of shedding the feathers generally takes place when the breeding season is over, and is called moulting.

Besides their uses as body covering and means of flight, feathers serve as sexual attractions, and in some cases as means of producing love-calls, as the "bleating" of the snipe, the rattling of the quills by peacocks and birds of paradise, and the "drumming" of the North American grouse.

The commercial importance of feathers is very great. The down of the Eider-duck (q.v.), and the feathers of swans, geese, and poultry are very largely used, the first for quilting articles of clothing, and the second for stuffing beds and pillows, and cushions. Despite the Selborne Society (q.v.), vast numbers of gay-plumaged birds are annually killed for trimming hats and bonnets, and the plumes of the Ostrich and the Marabout Crane figure for a large sum in our list of imports, while other birds are warred upon to provide muffs and feather-trimmings. [QUILL.]

Feather Star. [ANTEDON.]

Febrifuge, a medicine employed to reduce the temperature of the body in fevers. [ANTIPYRETICS.]

February (Latin *Februarius*, from a festival of the god Lupercus or Februus, part of the Lupercalia, held on the 15th of the month), the last month of the Roman year until Cæsar's reforms. The addition of January and February to the original

Roman year of ten months is attributed to Numa. [CALENDAR.]

Fécamp, a Norman seaport on the English Channel, in the department of Seine-Inférieure, at the mouth of a river, 23 miles N.E. of Le Havre. It is built in a narrow valley opening between two cliffs, and consists principally of one street of two miles in length, and is marked by a lighthouse. There is an inner harbour with a quay, and there is a considerable trade in Baltic and colonial produce. Many of the inhabitants are employed in the whale, cod, herring, and mackerel fisheries. There are cotton- and oil-mills, sugar refineries, etc., and the Abbey produces the renowned Benedictine liqueur.

Fechner, GUSTAV THEODOR (1801–1887), a German physicist and psychologist, studied physics at Leipzig, and became Professor of Physics in 1834. In 1828 he published a *Handbook of Experimental Physics*, and made researches into the theory of colour, and in the nature of galvanism upon which he published a work in 1831. In 1860 appeared his *Elements of Psychophysics*. He was also the author of essays and of poems.

Fechter, CHARLES ALBERT (1823–1879), a well-known actor, was born of an English mother, his father being a Frenchman. He went when a child to France, where he was trained as a sculptor, but took to the stage. He made his *début* in 1840, and in 1860 he made his first appearance upon the English stage, where he played *Ruy Blas*. He then played Shakespeare, and his Hamlet and Othello attracted much attention, partly from his departure from the old traditions as to how the parts should be handled, and partly owing to his foreign accent, which pleased some and displeased others. He became for a time lessee of the Lyceum, and in 1872 he went to America. His managerial career in America was not a success. He died in Pennsylvania.

Federalist Party, THE, in the history of the United States, arose soon after the Revolution, chiefly among the trading and capitalist classes who desired a strong central government and restriction of State rights. Washington, Adams, Hamilton and (at first) Madison were all Federalists, and the series of papers by the two latter and John Jay, published in the *New York Independent Journal* and afterwards republished under the title of the *Federalist*, did much to aid the transformation of the Confederation into a Federal Union. The chief strength of the party was in New England. It disappeared about 1812 from Federal politics, chiefly from its opposition to the war with England, though it lasted some years longer in State politics, in Massachusetts and elsewhere. It favoured the development of infant industries by protection.

Federation is defined by Professor E. A. Freeman as "any union of States stronger than mere alliance, but whose members enjoy more than merely municipal freedom." Federations in this wide sense are either confederations (the states composing which retain their full sovereignty, but are in permanent alliance) or federal unions, in which each state delegates certain of its sovereign powers to a central government, including the management of foreign relations, military and naval matters, certain powers of taxation, *e.g.* as to levying customs duties, and the right of legislation on certain specified subjects. All powers not specifically delegated remain vested in the governments of the separate states. Thus divorce is very easy in Indiana, but is not recognised at all in South Carolina; but neither state can impose customs duties or adopt a monarchical form of government. Normally, a federal union (to which the term federation is often confined) implies a written federal constitution, and a court or other central authority to expound it. Some external danger which the members could not resist singly, a high degree of similarity, and an approximate equality between all or many of the members, are usually conditions of federation. The Achæan League in antiquity, Switzerland, and the United States, are leading instances of federal republics, the German Empire (which is, however, controlled by Prussia) is a federal monarchy, and many persons hope that the British Empire will one day be a federal union.

Fee Simple, FEE TAIL. [ESTATE.]

Fees are particular sums of money claimed as their perquisite by official persons under authority of Act of Parliament, prescription, etc. The right to fees, as well as the amount of them, has in many cases been regulated by statute. Officers demanding improper fees are guilty of extortion. [EXTORTION.] The honoraria paid to counsel and physicians for their services are also termed fees; but they cannot be recovered by legal proceedings, while solicitors', surgeons', and surveyors' fees can be legally sued for. There are also school fees and surplice fees. As to school fees they are prescribed by the "Elementary Education Acts;" and as to surplice fees, they are not due to the minister as of common right, but depend on special custom only; while as to Easter offerings, it has been laid down that they are due of common right to him who exercises the spiritual functions of the parish, and that at the rate of twopence a head for all the parishioners of the age of 16 years and upwards. [OBLATIONS.]

Fehling's Solution, a reagent which is largely employed for the volumetric estimation of glucose, or grape sugar. It is prepared by dissolving copper sulphate, Rochelle salt, and caustic soda in water, in definite proportions. The solution of the two latter is kept separate from that of the copper salt, and only mixed when required for use. When a solution of grape sugar is added to this reagent, heated to boiling, a red precipitate of cuprous oxide Cu_2O is formed, and the blue colour which the reagent possesses is discharged. When sufficient sugar solution has been added to completely discharge the colour, the reaction is complete. The reagent is generally made of such a strength that 10 cc. are equivalent to ·05 dram of glucose. If cane sugar has to be estimated, it must be first converted into glucose, this being performed by treatment with a dilute acid.

Feili (*i.e.* Rebels), the collective name of the Luri-Kuchak Lurs, that is, of the Lurs of Little Luristân, province of Khuzistân, West Persia. They form the Pusht-i-Koh division of the Luri family, and, according to Macgregor, their numerous clans fall into seven main groups: Kurd, Mehaki, Shahan, Panj Sitûn, Donarwand, Lort, and Handemani, and on these are dependent the Bajilan, Beiranwand, and Hulilani, all belonging to the aboriginal Kurdish stock of the West Persian highlands—the Karduchi of Xenophon. But it should be noted that too wide a meaning has been given by Layard, and after him by Macgregor, to the Feili branch, under which they include the Pesh-Koh as well as the Pusht-i-Koh, the former being the collective name of the Lurs proper. [LURS.]

Feith, RHYNVIS (b. 1753), a Netherland poet, born at Zwoll in Overyssel. He studied law at Leyden, and in 1770 returned to his native town, of which he became burgomaster. His style was melancholy and sentimental. Among his works are a poem on *De Ruyter*, *The Grave* (*Het Graf*), *Old Age* (*De Ouderdom*), *Oden en Gedichten*, and he collaborated with Bilderdyk in *De Geuzen* (*The Beggars*), as the party of freedom in the 16th century were called. A collection has been made of his letters also.

Felidæ, the chief family of the Æluroidea (q.v.), containing the typical specimens of the Carnivora, and dating back to Eocene times. Some of the extinct forms were highly specialised, and in some respects more so than the living species, which Dr. Mivart is inclined to rank as "the very flower and culmination of the mammalian animal tree." The living family comprises two genera: *Felis*, with sixty-six species, and *Cynælurus*, with a single one. [CHEETAH.] Some authorities also make a separate genus of the Lynxes, which are almost peculiar to the Nearctic and Palæarctic regions. [LYNX.] The distribution is nearly universal, only the Australian region, Madagascar, and the Antilles being without representatives. The members of the family walk upon the tips of the toes, the whole heel and metacarpus being raised above the ground; and the soles of the feet are furnished with soft, cushion-like pads, that not only render progression noiseless, but serve to break the shock of the prodigious leaps taken by these animals in pursuit of their prey. There are five digits on the fore limbs, and four on the hinder ones, all armed with strong, sharp-curved, and highly-retractile claws, that form terrible weapons for disabling their prey and tearing it to pieces. The body is long and lithe, the skull rounded, and the limbs characteristically short, except in the Cheetah, whose legs are so long as to suggest relationship with the Dogs, to the observer who judges from appearances only, and in the Lynxes, in which group the tail is also short and the ears are furnished with a tuft of hair at the tip. The dental formula is $i\ \frac{3}{3}, c\ \frac{1}{1}, p\ \frac{3}{2}, m\ \frac{1}{1} = 30$. The canines have cutting edges and sharp points, and the premolars are well adapted for cutting, and act against each other like the blades of a pair of scissors. [CARNASSIAL TOOTH.] The tongue is covered with strong, horny papillæ, bent strongly backwards, and forming an efficient natural rasp to clear the flesh from the bones of the prey. The eyes are large, and under the influence of strong light the pupils become contracted to a mere slit in some species, and in others to a tiny hole. Most of the species are nocturnal, and more or less arboreal, with the exception of the lion and tiger. Their food is the flesh of warm-blooded animals, which they kill for themselves. The Fishing Cat (*F. viverrina*) will catch and eat fish and fresh-water molluscs, but all the rest have a great dislike to water, though many of them lurk in tall vegetation near lakes and rivers, so as to spring upon unwary beasts as they come to drink. No species is social, nor do they ever hunt in packs like the Dogs. They stalk their prey, and, having approached as nearly as may be without being discovered, rush upon it with a terrific spring, and, knocking it over with a blow of the fore limb, either carry it off or kill it on the spot. The senses are extraordinarily acute, though scent is not so keen as in the Dogs. Although intensely savage, all can be tamed if taken young, though the task is one that requires patience. But the "performing lions and tigers" of travelling menageries are cowed rather than tamed, as is shown by the untimely end of many "tamers" of both sexes. The coloration of the family is various; but the uniform tints of the lion and puma, the stripes of the tiger, and the spots and markings of the leopard and smaller cats are protective, and harmonise well with the surroundings of the animals in their natural habits, though at first sight this would scarcely seem to be the case. Young lions and pumas are also marked with feeble stripes or rows of spots, pointing to descent from an ancestor that was not uniformly coloured. [CARACAL, JAGUAR, LEOPARD, LION, OCELOT, OUNCE, PUMA, TIGER, etc.]

Felix, CLAUDIUS (1st century A.D.), a Roman procurator of Judæa, brother of Claudius's favourite, Pallas, and, according to Tacitus, profligate and unscrupulous. He lived in adultery with Drusilla, the wife of another. He it was who trembled when St. Paul spoke of a judgment to come. He was recalled in A.D. 63, and was in danger of being found guilty of charges of maladministration brought against him by the Jews.

Felix, MARCUS MINUCIUS, a Roman lawyer, who is thought to have lived in the 3rd century A.D. He was a Christian, and wrote an apology for the faith, called *Octavius*.

Fell, JOHN (1625–1686), was the son of Dr. Samuel Fell, Dean of Christ Church. He was educated at Christ Church, where he graduated in 1640. He at first took service in the Royal garrison, but afterwards was ordained, and was ejected during the Commonwealth, and retired into private life. At the Restoration he was made Dean of Christ Church, and in 1666 he became Vice-Chancellor; and his strict discipline gave occasion to the well-known epigram. [EPIGRAM.] He founded the University Press, and added much to the buildings of Christ Church. In 1676 he was made Bishop of

Oxford, still, however, retaining the Deanery of Christ Church. He was a man of the old school, and did not approve of the newly-founded Royal Society. He translated Wood's *History and Antiquities of Oxford*, and was buried in the cathedral.

Fellahîn (plural of *Fellah*, a labourer or peasant), the collective name of all the agricultural as opposed to the pastoral or nomad Arabs (*Bedâwin*), but applied in a special and somewhat contemptible sense to the peasantry of Egypt and Syria, most of whom are not originally Arabs, though now speaking Arabic. The Fellahîn live in villages under the government of a Sheykh-el-Beled, who has to see that their taxes are regularly paid to the Nazir or governor of the district. A Fellah may rise to the position of Sheykh or Nazir, but the governors of provinces are invariably Turks. The villagers are miserably poor, and suffer cruel treatment at the hands of the Turks. The taxes are excessive and uncertain, and the governors often extort more than the legal amount. The condition of the Fellahîn in this respect has, however, somewhat improved during the British occupation. Although their food is scanty—consisting chiefly of bread made of maize or millet, eggs, and raw vegetables, or in the case of the very poor of coarse bread and the mixture called "dukkah"—they are remarkably vigorous, and capable of undergoing great fatigue. They usually marry as soon as they can afford a dowry, as they are glad to obtain the assistance of a wife and children on their farms. They are described as affectionate parents, but when reduced to great poverty they are sometimes induced to sell their children to their fellow-villagers. The term is also applied, though apparently not in a depreciative sense, to the eight tribes of the Nisibin district in the Middle Euphrates valley, who are now subject to the powerful Shamûr Arabs. These are the Sebûr, Baggara, Sherâbrîn, Khudhr, Harb, Hadidrîn, Albu Aâsi, and Ghassameh, in all 52,000.

Fellows, Sir Charles (1779–1860), traveller and antiquary, was born at Nottingham. As a youth he travelled much, and then settled in London in 1820. In 1827 he visited Switzerland, Italy, Greece, and the Levant, and some of his sketches were utilised to illustrate *Childe Harold*. In 1838 he made some important discoveries in Asia Minor, and brought back from Lycia marbles that are now in the British Museum. He was knighted in 1845, and passed the latter part of his life in the Isle of Wight. Among his works are *Travels and Researches in Asia Minor* and *Coins of Ancient Lycia*.

Fellows of Colleges generally form the governing body, and are paid out of the college revenues. Since 1880 there have been two great classes at Oxford and Cambridge—Prize Fellows, elected usually after examination, and Official Fellows. The latter are required to reside in the college or university, and take part in tutorial or other work. Celibacy is now seldom enforced. Usually the appointment is for a term of years.

Felo de se (a felon of himself) is one who, being of sound mind and years of discretion, deliberately causes his own death, and also, in some cases, where one maliciously attempts to kill another, and in the carrying out of such attempt unwillingly kills himself, he is adjudged a *felo de se*. When the deceased is found by the coroner and jury a *felo de se*, all his chattels, real and personal, are forfeited to the Crown, though they are usually restored upon payment of moderate fees. A will made by a *felo de se* is void as to his personal estate, though not as to his real estate, nor is his wife barred of her dower. Formerly he was buried in the highway, with a stake driven through his body; but by 4 Geo. IV., c. 52, it is provided that a *felo de se* shall be privately interred at night in the burial-ground in which his remains might by law have been interred if the verdict of *felo de se* had not been found against him. The Interments Act, 1882, repealed and re-enacted the above Act, omitting the provisions as to the hours of burial, and allowing, by permission of the ordinary, a religious service, the Prayer Book expressly forbidding the use of the Burial Service therein contained in the case of those who die "laying violent hands on themselves." A coroner's inquest must be held in every case of suicide, and in the absence of evidence of unsoundness of mind, the verdict of *felo de se* must still be directed and returned. To attempt to commit suicide is a misdemeanour at common law. [Coroner, Felony.]

Felony is any capital crime short of treason, and being such as occasioned, at common law, the forfeiture of the felon's lands and goods. The word "felony," in its generic sense, includes even treason, and under particular statutes the offence of treason may be dealt with as a felony. All indictable offences are either felonies or misdemeanours; but a material part of the distinction is taken away by 33 & 34 Vict., c. 23, which abolishes forfeiture for felony, and provides for the administration of the estates of felons while undergoing sentence. The crime of felony may be said to stand half-way between treason and misdemeanour. As to its consequences to the felon, *see* Attainder, Escheat, Felo de se.

Felspar, the name of a group of closely related and intimately associated mineral species, the most abundant of rock-forming minerals. They are silicates of aluminium together with silicate of potash, soda, or lime, often coloured by iron-oxides; their hardness is about 6, or that of glass; and their specific gravity ranges from 2·54 to 2·76. They are divided into the *Orthoclastic*, Oblique, or Monoclinic, which yield cleavage forms with some pairs of faces at right angles, and the *Plagioclastic*, Anorthic, or Triclinic, which do not; or, chemically, into the more *acid*, containing over 60 per cent. of silica, and having a specific gravity not exceeding 2·7, and the more *basic*, containing less than 60 per cent. of silica, and having a specific gravity over 2·7. The acid felspars are the more insoluble in acids and the more infusible, and are especially abundant in the plutonic rocks, in which they are associated with free quartz, hornblende and mica. The basic felspars are more characteristic of the volcanic rocks, in which they are associated with augite, but

rarely with free quartz or hornblende. Most mineralogists now follow Tchermak in considering only three true species of felspar to exist, viz. *orthoclase*, or potash-felspar, *albite*, or soda-felspar, and *anorthite*, or lime-felspar, the other forms being varieties or twin-combinations of these. Orthoclase, a potash-felspar, crystallises in oblique rhombic prisms. When transparent and colourless it is known as *adularia*, or if with a bluish opalescence as *moonstone*, both of which forms are gems. More often it is nearly opaque, perhaps from partial hydration, and tinged with a salmon-pink, in which condition it is an abundant constituent of granite, felsite, eurite, and gneiss. It often occurs in large "porphyritic" crystals several inches long. It decomposes into china-clay, or kaolin (q.v.). *Sanidine* is a glassy, translucent variety containing some soda, and characterising trachytes and liparites. *Microcline* is a potash-felspar differing slightly in angle, thus becoming plagioclastic: *amazon-stone* is a valuable green variety. *Albite*, or soda-felspar, named from being generally white, is plagioclastic, but acid. It occurs in many diorites, syenite, and occasionally in granite. *Anorthite*, the lime-felspar, is also white and plagioclastic; but is basic, fusible, soluble in acid and heavy. It occurs in some gabbros and other basaltic rocks. *Oligoclase*, or soda-lime-felspar, is probably a combination of albite and anorthite, in which the former predominates; *andesine*, or soda and lime-felspar one in equal proportions; and *labradorite*, the lime-soda felspar, one in which anorthite predominates. Oligoclase commonly occurs with orthoclase in Scotch grey granites; andesine, in the basaltic rocks known as andesites from their occurrence in the Andes; and labradorite—which is often dark-coloured, and exhibits on some faces beautiful change of colours, blue, green, yellow, red or brown, from included fibres—in basalts, gabbros, and hypersthenites.

Felt, a fabric produced by the adhesion of the fibres of hair and wool, without any process of weaving. Hair has a serrated surface, the barbs pointing towards the upper extremity, so that when a mass of hair is subjected to pressure the barbs of one hair become firmly fixed in the indentations of another lying in the opposite direction. Wool felts more easily than ordinary hair owing to its tendency to curl, but the natural grease must be previously abstracted. Felting is probably an older invention than weaving; it was used at a very early date by the Armenians and Tartars in the manufacture of clothing and tent-covers, and is mentioned by Xenophon, Pliny, and Marco Polo. Moisture, as well as pressure, is necessary in felting, and heat is also serviceable. Thus in the manufacture of carpets, articles of clothing, and similar commodities, the process is as follows:—The wool is first of all carded out into a number of fine laps of the required length and breadth; these are then placed one upon the other until the desired thickness is obtained. The mass of wool is then moistened and passed between rollers, some of which are heated internally with steam. This is the final stage in the production of the felt, which is afterwards dyed, printed, or otherwise adapted to its purpose. The most extensive felting industry is the manufacture of hats. A coarser kind of felt is used for various mechanical appliances, such as covering steam boilers, polishing wheels, pianoforte-hammers, etc. In such cases cow-hair is often the chief ingredient. The "asphalted felt" used in roofing is felt of a coarse quality which has been immersed in asphalt, pitch, or coal-tar.

Felton, Cornelius Conway (1807–1862), was educated at Harvard, where he became Professor of Greek in 1834 and President in 1860. His best known work is *Greece, Ancient and Modern.*

Felton, John (1595–1628), the assassin of the Duke of Buckingham (q.v.). The elder Dumas has made an important figure of him in *The Three Musketeers.*

Felucca, a small ship with two masts and a lateen sail, common in the Mediterranean. It sometimes has a rudder at both ends.

Felûp (properly Fulûp), a Negro people of Senegambia, whose territory extends along the Atlantic coast from the Gambia river south to the Cacheo (Kajiu) river. It is thus mainly limited to the Casamanza basin, though it appears to have formerly extended to the Geba and the Bissagos Islands, some 70 miles farther south. Fulûp was originally the name of a single tribe, which was later extended by the Portuguese traders to the Yola, Ayamat, Jigûsh, Karon, Vaca, Joat, Banyûn, Banjar, Bayot, and all the other kindred tribes, who jointly with the Sereres, Filhams, Bolas, Pepels, and Kanyops of the Rio Grande, form a Negro family distinct at least in speech from all the other natives of Senegambia. The Fulûps proper exhibit all the physical and moral characteristics of the typical Negro in an almost exaggerated form. The complexion is decidedly black, the face flat, the nose flat and broad at the base, the lips very thick and everted, the hair short and woolly and absent from the face, the figure rather short but strong and muscular. There is no tribal cohesion, every village being independent, and mostly at war with its neighbours. Even the family is scarcely developed, promiscuous unions being still everywhere prevalent. The kidnapping or sale of children is also universal, and the passion for drink is carried to an excess elsewhere unknown. The people go naked, armed with the bow and arrow, and live in log huts, which are substantially built, but indescribably filthy. (Bertrand-Bocandé, *Sur les Floups ou Féloups*, *Bulletin de la Soc. de Géographie*, 1849.)

Felygyhaza, a town of Hungary, 66 miles S.E. of Pesth. It has a fine town-hall, and is noted for its great cattle-market. In the neighbourhood are vineyards, and fruit, corn, and tobacco are cultivated. Many Roman urns and other relics have been found. The town was destroyed by Turks in the 17th century, and for many years remained desolate.

Femur, the bone of the upper part of the leg. It articulates by its head or upper portion with the ilium, forming the hip-joint, and enters at its lower portion with the tibia into the formation of the knee-joint. The femoral artery is the main arterial trunk of the thigh.

Fences are used in agriculture to prevent cattle from straying, and to protect land from the inroads of stray animals. Among the rudest kinds of wooden fence is the snake-fence, which is simply made by laying logs together so as to form a zig-zag line. When wood becomes scarce the fence is formed by laying rails horizontally across stobs fixed in the ground at intervals of two or three yards, to which they are attached by nails. The stob-and-rafter fence is a firmer but more expensive structure, consisting of stobs three or four inches apart, bound by a rail which runs along their upper extremity. In America rails are often split and sharpened so as to fit into openings in the stob. In old countries, where both wood and stone are scarce, their place is taken by hedges of plants, the hawthorn being commonly used in England. Wire fences are now common both in England and in Australia. In England it is incumbent on the tenant to keep and leave fences in due repair, but if he erects a wire or other temporary fence he may remove it if he can do so without injuring the ground.

Fencing. The art of fence (or of defence, as it was more commonly termed in earlier days), taken in its broad sense, means the art of wielding hand weapons for attack and defence. The attack is rightly included in the definition, for in no mode of fight is real "defence" possible without its combination with "offence." Thus the word *fencing* would refer to all scientific hand-to-hand fighting, including such branches as boxing and cudgelling. By convention it has, however, at all times been applied only to steel weapons retained in the hand, swords of all kinds, daggers, and hastate implements of war. In later days "fencing" has been restricted, in general use, to the dexterous management of the sword; and in England the meaning of the word is still further confined to mere foil-play.

As a matter of fact, the broad principles of the art of fence are the same for all hand weapons. They can, however, be put into practice to the greatest perfection of neatness and accuracy with light and well-balanced implements, like the modern duelling swords and sabres.

The historical evolution of the "theory" concerning the essence of true *dexterity in arms* illustrates well wherein perfection lies; the improvement in the rules of fence have always been in the direction of simplicity.

In England we had long a very excellent, sturdy, if somewhat rough, method of broadsword play, but the wielding of the rapier in Elizabethan days and of the small-sword in Georgian times was always best taught by foreigners—first by Italians, and later by Frenchmen. Hence the fact that most of our fencing terms are but slightly-modified Italian or French words.

The *theory* of attack and defence may be summarised as follows:—

The first notion which it is necessary to grasp is the importance of "time," "measure," and "guard" (*tempo*, *misura*, *guardia*; *temps*, *mesure*, and *garde*).

An all-important principle in all fencing is to keep the proper "measure"—namely, to remain out of easy reach when on the defensive, and, conversely, never to attempt the delivery of an attack without being well inside striking distance. This law, which savours perhaps of a truism, is nevertheless one generally neglected by inexperienced or over-impetuous fencers. The next is to keep proper "time"—namely, in the first place, to reduce all motion of either body or weapon to the smallest necessary, both in point of number and in extent; in the second, to balance those motions carefully on the adversary's in order to remain always in position to seize at once every opportunity of offence or defence. The third is to keep proper "guard." A man is on "guard" when, holding his weapon in front of him, he is so placed that he can deliver every regular attack and come to every recognised parry with the minimum expenditure of energy.

The fencer on guard has four main attacks to choose from, and similarly four "openings" to defend. These are defined by reference to what are conventionally called "lines" (*linea*; *lignes*). An attack, for instance, delivered *above* the adversary's hand is said to come in a "high line;" below the hand, in a "low line;" to the right of the hand, in "outside line;" to the left, in "inside line."

Now every attack has its parry (*parata*, from *parare*, to protect; parade), just as every parry can be "deceived" or evaded by a "feint" (for it can never be too much repeated that there are no such things as "secret strokes" in swordsmanship). Four parries, so formed that the length of the defending weapon crosses the line of attack, are, strictly speaking, sufficient to meet all the requirements of defence. But in each of the four "lines" both attack and parry can be effected in two widely different positions of the hand—namely, either in *supination* (that is, with the nails turned upwards) or in *pronation* (nails turned downwards). Thus, there are actually eight natural ways of attacking and parrying sword (or any other "white arm") in hand—namely, two in each line, "carte" and "prime" (*quarta* and *prima*), in high-inside; "sixte" and "tierce" (*sesta* and *terza*), in high-outside; "septime" and "quinte" (*settima* and *quinta*), in low-inside; "second" and "octave," in low-outside. The terms used in England are the actual French words, derived from the older Italian schools. Carte, sixte, septime, and octave are *in supination;* the others *in pronation.*

The opponents on guard must, of course, be *engaged* in some definite manner with reference to "lines" and hand-position—that is, engaged in carte or tierce, or any other guard. (As a matter of fact, these two engagements, with that of *sixte*, are the most generally used.) The engagement covers, and naturally closes access to, one of the lines, but one only. To effect his purpose the attacking party must either seek another line or *force* an entry by "breaking the guard." This can

be done by "beating" or by "binding" the adverse blade; but the best mode is to "disengage" (by passing the point under the adversary's hand), or by "over-cutting" (passing the point over) so as to come from outside inside, or *vice-versâ*, of the opponent's sword.

To meet attacks in a given line (other than that covered by the guard), the defending party must use a *parry* (the words guard and parry are *not* synonymous, as so many swordsmen seem to think) —that is, he must move his weapon so as to cross the new line. If the parry be made by thus passing from one guard to another, it is called "simple" or "opposition;" but if it be made so as to bring the adverse blade back to the original engagement, it becomes a "circular" or "counter" parry (*contro; contre*). There are, of course, as many simple and counter parries as there are attacks and guards—namely, eight, as above recited, two for each line.

It is naturally open to the attacker to "feint" —that is, to menace in one line with a view to obtaining an opportunity of delivering the stroke in another. Success in this attempt depends on precision and superiority in speed. The attack has to be delivered (if the opponent keeps his proper measure) by means of the "lunge" (*botta lunga; coup d'allonge*)—that is, by a step taken with the advanced foot, whilst the leg in rear is straightened. An attack thus put in, if parried, exposes the attacking party to the *repost* (*risposta*, an answer; riposte), which is a return attack dealt without lunging. The parry to be effective without an unnecessary expenditure of energy should bring the "fort" (the strong, the half nearer the hand) of the defender's weapon to bear upon the "foible" (the weak, the half nearer the point) of the attacker's blade; this, of course, secures the advantage of lever. Of the eight attacks and parries only six are really in general use—carte, tierce, seconde, sixte, and septime. Quinte and prime are more rarely resorted to.

Simple as these principles may appear, it has taken some three hundred years of practical fighting to bring about their universal recognition. They apply, as was stated above, equally to all cutting and thrusting weapons.

[For a complete history of the art, consult *Schools and Masters of Fence*, by Egerton Castle (Bohn's Artists' Library), and, for a *practical* treatise, select *The Swordsman*, by A. Hutton (Grevel and Co.).]

Fénélon, François de la Mothe (1651–1715), French prelate and author, was born in Perigord at the Château Fénélon. His uncle educated him at Cahors, and he was in youth of a gentle nature, a vivacious character, but a feeble constitution. He is said to have preached effectively at 15. He was sent to St. Sulpice at Paris, and took orders at 24, and became *curé* of St. Sulpice. He made his mark as the president of a female order, whose duty it was to teach Huguenot converts, and the king set him to the work of converting Huguenots—a post for which his persuasive eloquence made him eminently fitted. In 1681 he was made Prior of Carennac, and soon after published a *Traité de l'Éducation de Filles*, which made a great sensation. In 1689 he was chosen to educate the king's grandsons—the Dukes of Burgundy, Anjou, and Berri—and he had great influence over the first of these, who, however, unfortunately died early. In 1694 he was made Archbishop of Cambrai. At this period of his life he had a theological controversy with Bossuet, and, falling beneath the displeasure of the Pope and of the king, was banished to his diocese. Here he published his celebrated *Télémaque*. The book caused some commotion, as Fénélon's enemies represented it as a libellous satire upon the king and court. His life and letters have been published, and in 1825 his *Œuvres Choisies*, with a biographical and critical notice, were published in six volumes at Paris.

Fenians. The original Fenians were mercenary troops in the service of the kings of Eire. They are said to have been composed of the tribes who were subjugated by the Scots in the first century of our era, and to have formed a regular standing army, consisting of three bodies, each modelled on the Roman legion, with which the Scots may have become acquainted during their inroads into Britain. They took their name from the hero Finn MacCumhail, who belonged to the Clan-na-Boiscné or Leinster body of Fenians. They were finally disbanded by the king of Eire, and entered the service of a rival king, but were nearly annihilated in the battle of Gabhra or Gavra (284 A.D.).

The modern society with this title, which aims at the subversion of British rule in Ireland, was founded in America, whither large numbers of Irish flocked after the famine of 1846–47. The association was composed of a "Senate," which held meetings at New York, and a number of "circles," each managed by its own "centre," which extended over the whole of the United States, and was especially active in Chicago and its neighbourhood. The "centres" were chiefly engaged in levying recruits, furnishing them with arms and training them in their use, and collecting funds for carrying out the revolutionary schemes determined on. The organisation gradually extended to Ireland, and parts of England with a large Irish population, and at last assumed such proportions that the British Government became alarmed. The Habeas Corpus Act was suspended in Ireland, additional troops were sent over, many of the leaders—including the "head-centre," James Stephens—were seized, and the chief organ of Fenianism, O'Donovan Rossa's *Irish People*, was suppressed. Some of those found guilty of treason were sentenced to penal servitude. The prompt action of the Government crushed sedition in Ireland for a time, but the escape of Stephens from prison revived the courage of his associates. His return to America, in company with other Fenians, was the signal for an abortive inroad into Canada (1866). In the spring of 1867 the struggle was renewed on British soil; an attempt was made to seize Chester Castle as the prelude to a general insurrection; it was unsuccessful, and several ill-organised risings in Ireland during the same year met with no better fortune. In the autumn of 1867 great excitement was caused in England by an attack on a police-van at

Manchester, resulting in the death of a constable, and by an attempt to blow up the wall of Clerkenwell gaol. In both cases the object was the release of prisoners suspected of Fenianism. In 1871 the United States Government received information of a projected raid into Canada in time to prevent its taking place. Among more recent movements of the Fenians we may notice the formation of a "Skirmishing Fund" (1883–85), the establishment of the Clan-na-Gael, and the murder of Lord Frederick Cavendish by a body of "Invincibles" in Phœnix Park, Dublin (1882).

Fennec (*Canis zerda*), a small North African fox, ranging into Asia, and remarkable for its large ears and its fondness for fruit rather than for

FENNEC.

animal food. [Fox.] Some authorities suppose that the reference in the Song of Solomon (ii. 25) is to animals of this species.

Fennel (*Fœniculum*), a genus of umbelliferous plants, with compound umbels without involucres, yellow petals, and aromatic fruits. The common fennel (*F. vulgare*), a native of South Europe, now established on our coasts, reaches 4 feet in height, has its leaves cut into numerous linear segments, and from fifteen to twenty rays to its umbels. Roman Fennel, cultivated near Nismes, has from twenty-five to thirty rays, and produces curved fruits $\frac{2}{5}$ inch in length. Indian Fennel (*F. Panmorium*) produces shorter and straighter fruits. Oil of fennel and fennel water, used as stimulants and carminatives, especially for veterinary purposes, are distilled from them. They contain the stearoptene *anethol* or anise-camphor ($C_{10}H_{12}O$). Fennel leaves are used as a garnish to boiled fish.

Fenugreek (*Trigonella Fœnum-græcum*), an erect annual leguminous plant about 2 feet high, probably a native of Asia, but cultivated for hay by the ancient Greeks and Romans, and still in Egypt and India. Its leaves consist of three leaflets, the terminal one stalked; the flowers are in axillary umbellate clusters, and the sickle-shaped pods contain ten to twenty seeds, from which 6 per cent. of a bitter oil can be obtained. The seeds are used in curry-powder, in cattle foods, and to improve the flavour of inferior hay. The whole plant, and especially the seed, contains the aromatic principle *coumarin* ($C_9H_6O_2$), which also occurs in the Tonquin Bean, in sweet wood-ruff, in melilot, and in the sweet-scented vernal grass *Anthoxanthum odoratum*, giving the perfume known as "new-mown hay."

Fenwick, Sir John (1645–1697), an English conspirator, served for a time in the army, and in 1688 entered Parliament as a Tory member for Northumberland. He was accused as an accomplice in a plot to assassinate William III., and was committed to the Tower in 1696. He made statements involving the Whig leaders in the plot, and they brought in a bill of attainder against him, which was passed, and he was beheaded.

Feoffment, a form of transferring a freehold in land, whether it be a fee-simple, a fee tail, or an estate for life. [Estate.] It is not at the present time much in use, and it is effected by the person who is in possession (the feoffor) delivering up the possession to another (the feoffee), and expressing at the same time what estate in the land the feoffor intends that the feoffee shall have. Before the Statute of Frauds (29 Charles II., ch. 3) came into operation no writing was necessary to show for what purpose, or for what estate, possession was given of the land, but this statute requires a writing which is usually a deed. [Deed.] There is a copy of an ancient charter of feoffment in the appendix of vol. ii. of *Blackstone's Commentaries*. The giving up of possession is termed "livery of seizin," the word seizure indicating a freehold interest. [Freehold.] The word feoffment is derived from feof, fief, feud. This livery of seizin may take place on the land when the feoffor and feoffee are both present there by the feoffor declaring his will to give up possession, and by the feoffee showing that he takes possession. It has been erroneously supposed that the delivery on the land by feoffor to feoffee of a clod of earth, or of a twig broken from the land, is a delivery of a symbol of possession. No symbol would satisfy the purpose, the feoffor must actually give up possession, and the feoffee must take possession, and the delivery of a clod of earth, or twig, are merely modes of showing the intention of the parties, and are not necessary. A feoffment may be made in view of the land if there be vacant possession, but the feoffee must take possession or he will not have got seizin. The writing must express the estate or interest which it is intended to convey to the feoffee; if no quantity of estate is expressed the feoffee acquires an estate for his life only. In order to convey the fee the word heirs must be used in the writing of feoffment. Livery of seizin may be made and taken by attorney. If land be on lease no livery can be made without the consent of the lessee or his representative in title, and who occupies the land. In gavelkind a feoffment may be made by any one of the age of 15 years. [Gavelkind, Feudal System.]

Feraga, an Arab tribe of Algeria, province of Oran, forming two groups: Feraga Thata (Lowlanders), and Feraga Fuaga (Highlanders). The

former occupy the plain comprised between the Sig and Habra rivers; the latter hold the slopes of the Sid-bu-ziri mountains skirting the same plain. Since 1866 both have been subject to French administration.

Ferah, three Berber tribes of Algeria: (1) *Beni-Ferah*, province of Algiers south-west of Cherchel, in the hills between Cheliff and the coast; (2) Uled-Ferah, same province, west of Aumale, Dirah Mountains, about the head waters of the Isser and Wed-Sahel rivers; (3) province of Constantine, Aures mountains, 15 miles north of Biskra, and in a neighbouring oasis, where they cultivate the date-palm, fig, and olive, and raise crops of barley by artificial irrigation.

Ferdinand V. OF ARAGON (1453–1516), commonly known as Ferdinand the Catholic, a title conferred upon him by the Pope in reward for his expulsion of the Moors from Spain. He was an astute prince, and a profound, though crafty, politician; and his marriage in 1496 with the devout and enthusiastic Queen of Castile—Isabella—laid the foundation of Spain's greatness, though the joint action of the pair in establishing the Inquisition (1480), expelling the Jews (1492), and expelling the Moors (1501) was the primary cause of their country's decay. Cardinal Ximenes played no small part in the successes of the reign. The conquest of Granada, which took place in 1491 after ten years' war, the discovery of America for which Isabella furnished ships, and the acquisition of Naples (1503) and Navarre (1512) were the chief events of the reign. Two years after Isabella's death, which occurred in 1504, Ferdinand married again.

Ferdinand I. (1503–1564), Emperor-elect, was the brother of Charles V. Though he took the title immediately after his brother's abdication in 1556, it was not till two years later that he was acknowledged by the electors. In 1527 he became King of Hungary and Bohemia, which two countries thenceforward became part of the Hapsburg dominion. The Emperor was mild and an advocate of religious tolerance, and enforced the claims of his Protestant subjects at the Council of Trent. At a Diet held at Augsburg in 1559 he regulated the currency of the Empire, and redressed certain hardships which weighed upon his Protestant subjects.

Ferdinand II. (1578–1637), Emperor-elect, succeeded to the throne in 1619 upon the death of his uncle, Mathias. He was educated by the Jesuits, and was strongly opposed to Protestantism, and was most anxious to support all the decrees of the Council of Trent. This policy aroused the Bohemians, who declared the crown forfeited, and offered it to Frederick V., Elector-Palatine. Hence arose the Thirty Years' War. By the support of allies he was able to hold the throne, and his harsh measures drove many of his Protestant Bohemian subjects into exile.

Ferdinand III. (1608–1657), Emperor-elect, was the son of Ferdinand II., and succeeded his father. He had served in the Thirty Years' War, which, against his wishes, he was obliged to continue till the Peace of Westphalia (1648). His reign was otherwise uneventful.

Ferdinand I., King of the Two Sicilies (FERDINAND V. of Naples) (1751–1825), was the son of Charles III. of Spain. When the father became King of Spain, the son succeeded him as King of Naples. His marriage with a daughter of Maria Theresa led to a close understanding with the Cabinets of Austria and Great Britain, and an opposition to the French after the Revolution, which led to three different humiliations of Ferdinand by the French. In 1814 the Congress of Vienna confirmed his title as King of the Two Sicilies, and in 1815 he was again established at Naples upon the flight of Murat, whom Napoleon had put upon the Neapolitan throne. In 1820 his disregard of an oath to observe a new constitution led to his further flight, but Austrian aid re-established him as a despot in 1821.

Ferdinand II.(1810–1859), commonly known as King Bomba (q.v.), King of the Two Sicilies, was the son of Francis I. and grandson of Ferdinand I. above-mentioned. He succeeded to the throne in 1830, and his despotic measures caused such additional discontent that his subjects revolted in 1848, and in that year he bombarded his capital. He made many promises of constitutional reform, but broke them on restoration to power, and in spite of the protests of Great Britain and France, who withdrew their ambassadors, he continued his despotic career, and filled his prisons with political prisoners. The storm came in his son's reign, when the crown of Naples and of the Two Sicilies became merged in that of Italy.

Ferdinand VII. (1784–1833), King of Spain. Being opposed to the policy of the chief minister of his father Charles IV., he was arrested as a conspirator, but a rising in 1808 forced his father to abdicate in the son's favour. In the same year he was forced to abdicate to Napoleon, who put Joseph Bonaparte on the throne, and kept Ferdinand in prison till 1813. After the downfall of Napoleon he returned to his throne, but his arbitrary rule caused continual outbreaks. By a Pragmatic Sanction of 1830 he abolished the Salic law, and left the crown to his daughter Isabella, excluding his brother, Don Carlos. [CARLISTS.]

Ferghana, a province of Russian Turkestan, in a valley at the head of the Jaxartes, and of importance at the present moment as bordering upon the region of the tributaries of the Oxus, in which Russia is extending her influence. It is in a range of the Thian-Shan mountains, and the only opening is at the west, where the river issues. The valley is an oval, 280 miles long by 140 miles wide, and contains over 28,000 square miles. It is on the road from Bokhara to Kashgar, and is very fertile in the south, and has fine mountain pastures. A new capital—Namanghan—has taken the place of the old one—Khokand.

Ferguson, ADAM (1724–1816), a Scottish historian and political writer, was born in Scotland, and educated at Perth and St. Andrews, whence he

proceeded to Edinburgh to study for the ministry. He was for a time chaplain in the Black Watch, but, returning to Edinburgh after the peace of Aix-la-Chapelle, he became Keeper of the Advocates' Library in 1757. In 1759 he was appointed to the Professorship of Natural History, and in 1764 to that of Moral Philosophy. In 1774 he went with the Earl of Chesterfield on his travels. In 1778 he was secretary of a commission sent to America to try and arrange matters with the colonies. The next year he came back and resumed his duties until 1784, when he resigned, and spent the rest of his time in travel and retirement. Among his works are an *Essay on Civil Society*, *Institutes of Moral Philosophy*, a *History of the Roman Republic*, and two volumes of *Lectures*.

Ferguson, JAMES (1710–1776), an experimental philosopher, mechanician, and astronomer, born at Keith in Banffshire. As a boy he made a wooden clock, and, when employed upon a farm to keep sheep, he used to study the stars and measure their relative distances by a knotted string. Some wealthy neighbours encouraged his endeavours, and put him into the way of studying mathematics and drawing, and for some time he supported himself in Edinburgh by executing miniature portraits. In 1743 he came to London, where he published some astronomical tables and lectures, and the Prince of Wales settled a small pension upon him. In 1763 he became a F.R.S. He produced many works and papers, and was strong in astronomy and experimental physics, but was weak in mathematics.

Ferguson, PATRICK (1744–1780), was born in Aberdeenshire, and served in 1752 in the army operating in Germany. In 1776 he invented a breech-loading rifle. He was at the battle of Brandywine (1777), where he had an opportunity of killing Washington, but refrained. He died in South Carolina.

Ferguson, SIR SAMUEL (1810–1886), poet, scholar, and antiquary. He was educated at Trinity College, Dublin, and was called to the bar. He was President of the Royal Irish Academy and Deputy Keeper of the Records. In 1878 he was knighted. Among his works are several volumes of Celtic poems; in 1865 he published *Lays of the Western Gael*, and in 1883 *The Forging of the Anchor*; and he deciphered the Ogham Inscriptions.

Fergusson, ROBERT (1750–1774), a Scottish poet, was born at Edinburgh and educated at Edinburgh, Dundee, and at Edinburgh University and St. Andrews. First intending to enter the Church, he gave up this idea, and became a Writer to the Signet. He wrote poems both in pure English and in dialect, and was a good conversationalist. Excesses were partly the cause of his early death.

Ferishtah, a Persian writer, who was born near the Caspian Sea towards the end of the 16th century. At the age of 12 he went with his father, who was appointed tutor to an Indian prince, to India. In 1589 he began his valuable work, *A History of the Mohammedan Power in India*, the materials for which he showed much patience and diligence in collecting. A good translation of this was published in London in 1829, as well as an earlier one at Bombay in 1831.

Fermanagh, an inland county of Ireland, in the province of Ulster, having an area of 714 square miles, and almost cut in two by Lough Erne. The county is generally undulating, with abrupt heights, but towards the west it is mountainous. The highest point, on the border of Cavan, is 2,188 feet. The soil varies, and is not remarkable for fertility. The farms are small, the chief productions being cattle, oats, flax, and potatoes. The county is well wooded, the principal trees being oak, ash, elm, beech, and fir. There is much limestone, and some coal and iron ore. Coarse linen is sparingly manufactured. The county returns two members to Parliament. Chief town, Enniskillen.

Fermat, PIERRE DE (1601–1665), a great French mathematician, was born near Montauban. Studies made in his youth with Pascal upon the properties of numbers led to his working out a calculation of probabilities. He also studied the theory of numbers, discovered a new way of squaring the parabola, and did much towards advancing geometrical science. He was also of considerable linguistic attainments, and had a controversy with Descartes upon geometry and optics.

Fermentation. The term fermentation (*fervere*, to boil), was originally applied to the alcoholic fermentation only, in which, owing to the production of gas, an effervescing liquid is obtained. Later the word was also used to denote many cases of effervescence to which it is no longer applied, and was extended to include phenomena of change or decomposition in various organic substances when exposed to air. These changes are generally due either to oxidation, or to the breaking down of complex molecules; but synthetic fermentations are also known as cases in which the principal products are reduction compounds. It was early recognised that a foreign substance, the *ferment*, was necessary to cause fermentation in most cases; but the nature of the ferments and of the process of fermentation was long unknown. At first the process was supposed to be due to purely physical causes, as in the theory advanced by Liebig. By the work of Schwann and Pasteur, however, it was shown that the *yeast*, the ferment necessary for the formation of alcohol, consisted of living organisms upon whose vitality the fermentation depended. Pasteur's further work showed that most ferments consisted similarly of organisms, usually bacteria or fungi, and that to each form of organism corresponded a particular fermentation. Some ferments, however, consist of unorganised compounds known as *enzymes*, which have not yet, however, been produced otherwise than through the activity of living matter. Since Pasteur's time much work has been done by many observers upon this subject, and though they tend to confirm Pasteur's views, no satisfactory theory of the action of ferments and the exact nature of the fermentative changes has been forthcoming. Most of the advances have been due to the use of pure cultivations of bacteria, by

which means the fermentation changes to be studied are not masked by subsidiary decompositions induced by other organisms. The preparation of such pure cultivations has therefore formed an important part of the work of chemists who devote their attention to this subject. [BACTERIA.]

In almost all cases a moderately high temperature and the presence of moisture are favourable to fermentation, which, in most cases, cannot proceed below 0° or above 100°. Certain substances, too, have the power of preventing fermentations where the ferments are organisms; as the various antiseptics used to prevent *putrefaction*. Among the more commonly known fermentations may be mentioned the *alcoholic* or *vinous*, *acetic acid*, *lactic acid*, and *nitric acid*.

Alcoholic fermentation of sugar, which plays such an important part in the preparation of so many beverages, has been known since very early times, and fermented liquids were known to the early Egyptians, etc. The decomposition was carefully examined by Lavoisier at the beginning of the present century, who showed the two main products of the reaction were alcohol and carbon dioxide. Very many organisms—chiefly microscopic fungi—can induce alcoholic fermentation, the form present in greatest quantity in the yeast usually employed being known as *Saccharomyces cerevisiæ*. These are small round cells of about ·0003 inch in diameter, which multiply very rapidly during the fermentation, which proceeds most rapidly at about 25° C. Cane-sugar is not directly fermentable, but is first converted into a mixture of dextrose and levulose, which then undergoes fermentation. The equation representing this change is

$$C_{12}H_{22}O_{11} + OH_2 = 2C_6H_{12}O_6,$$

while the further change into alcohol and carbon dioxide is given by

$$C_6H_{12}O_6 = 2\,C_2H_6O + 2\,CO_2.$$

Besides these main products, *glycerine* (2·3 per cent.), *succinic acid* (·6 per cent.), and a number of higher alcohols known collectively as *fusel oil* are also produced. These latter are probably due to the presence of other ferments.

Acetic acid is formed from alcohol in the presence of a fungus, *Mycoderma aceti* and of *Bacterium accti*. The fermentation, which is essentially an oxidation, is utilised commercially for the manufacture of vinegar. Crude alcoholic liquors are mixed with a little vinegar, and exposed to air in large wooden tubs filled with beech shavings, the liquid collecting at the bottom being again passed through the tubs. To this fermentation, which proceeds best at about 30° C., is due the souring of alcoholic liquors when exposed to the air.

Lactic acid fermentation is a sugar decomposition which is induced in grape, cane, milk, and other sugars, when these sugars mixed with some albuminous material are exposed to air. The organism which effects the change is probably that known as Penicillium glaucum. To produce the fermentation putrid cheese and chalk are added to a strong solution of sugar, and the mass allowed to stand some days in a warm place (40° C.). The chalk is necessary to neutralise the lactic acid when formed, as the fermentation does not proceed in an acid solution. The reaction is represented by the equation

$$C_6H_{12}O_6 = 2\,C_3H_6O_3.$$

If the action be allowed to proceed further the lactic acid itself is decomposed with the formation of *butyric acid*, and evolution of hydrogen and carbon dioxide.

Nitric and *nitrous* acids are obtained by the fermentative changes which ammoniacal salts undergo under the influence of organisms present in fertile soils. The process is known as *nitrification*, and the natural formation of nitre is due to this fermentation, which is very important in agriculture, as plants are unable to derive the necessary nitrogen from the ammoniacal salts themselves.

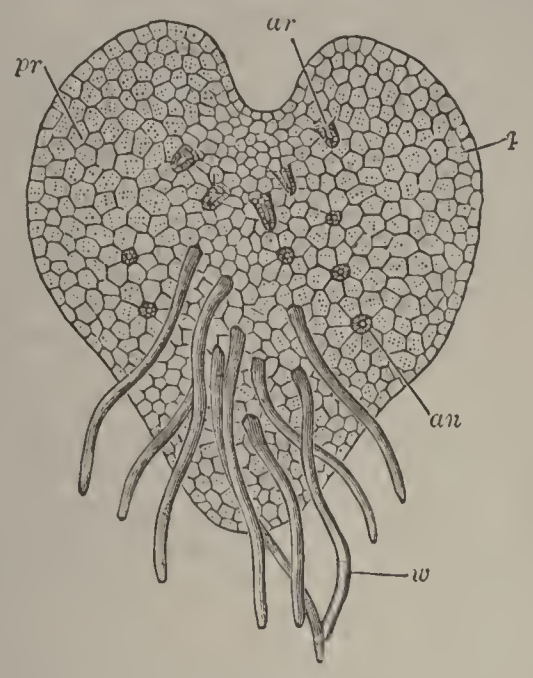
The unorganised ferments, *enzymes*, chiefly effect changes by causing an abstraction or addition of the elements of water with a simultaneous decomposition of the compound. In many cases their action can be imitated in the laboratory by the use of acids or alkalis. They play a most important part in digestion, many insoluble foods being rendered assimilable by their influence. They may be partially divided into:—(1) The sugar-forming, as the *ptyalin* of the saliva, *diastase*, *emulsin*, *invertin*, etc., which cause the decomposition of starch and other allied compounds into grape-sugar; (2) Those which cause the formation of *peptones*, as *pepsin* or *albumen;* and (3) *fat-decomposing* enzymes.

The changes which obtain in organic material and are known as *putrefaction* are also due to fermentation induced by a large variety of organisms. The subject has not been fully investigated, but much interest is attached to the formation in most cases of a number of poisonous basic substances known as *ptomaines*, many of which have within recent years been isolated and examined by Brieger and other chemists.

Fernando Po, a West African island, situated in the Bight of Biafra, 20 miles from the mainland, in lat. 3° 12′ to 3° 47′ N. and long. 8° 26′ to 8° 57′ E., being oblong in form, 35 miles long, and 22 miles wide in the south, its broadest part. A ridge of mountains, running from N. to S., passes through two-thirds of the length of the island, its highest point being in the north, where Clarence Peak reaches a height of 11,000 feet. The island is well provided with harbours, the largest being Maidstone Bay, on the N.E., with Clarence Town on the creek that leads out of it. This was originally an English settlement, made by permission of Spain, and afterwards abandoned. The island is beautifully wooded, the chief trees being the palm and the notable silk-cotton tree. The fine native race seems peculiar to the island. The island was first settled by the Portuguese, and was ceded in 1778 to Spain, which now owns it.

Ferns, a popular term for certain groups of Pteridophyta, or vascular Cryptogamia, the precise limits of which have not as yet been generally agreed upon. The club-mosses (q.v.), or Lycopodinæ, and Equisetinæ [EQUISETUM] are sometimes

termed "fern-allies;" but the tropical Marattiaceæ, which have the habit of ordinary ferns, and the less similar Ophioglossaceæ, the adders'-tongues and



THE GAMETOPHYTE OR PROTHALLIUM OF THE SHIELD FERN (*Aspidium*), magnified.
ar, Archegonium; *an*, antheridium; *w*, root-hair; *pr*, prothallium.

moon-worts, both of which groups differ from ordinary ferns in the mode of origin of their sporangia, are popularly known as ferns. On the other hand, this name has not been usually applied to the Rhizocarpeæ (q.v.) or Hydropterideæ, such as the pill-wort (Pilularia), which are now classed as heterosporous ferns. [FILICINEÆ.]

Ferns commonly exhibit a marked alternation of generations (q.v.), their life-history consisting of a small and transient oophore, gametophyte, or prothallium, and of the more familiar sporophore, or fern-plant. Apogamy (q.v.), in which the sporophore results from the vegetative growth of the prothallium, without sexuality, occurs normally in some species; but the correlative apospory (q.v.), in which prothallia, or rudimentary sexual organs, spring directly from the frond, without the formation of spores, has been chiefly observed in cases of abnormality. The spore, which is unicellular, and sometimes contains chlorophyll, on germinating gives rise to a small plate-like prothallium, generally heart-shaped, composed of one layer of green cells giving off numerous root-hairs, and bearing the antheridia and archegonia on its under surface. The antheridium is a small papilla, the central cells of which each produce an antherozoid. This consists of a flat band of protoplasm coiled spirally three or four times, with numerous cilia towards its apex, and its mother-cell, containing a few starch-grains, loosely adherent to its broader end. The outer cells of the antheridium absorb water when it is mature and burst it, liberating the antherozoids. The archegonia are less numerous than the antheridia, and are flask-shaped; but, unlike those of mosses, their "venter," or swollen portion, is sunk in the prothallium, and their "neck" consists only of four to six tiers of four cells each. The canal-cells in the neck become mucilaginous, and are partly expelled, the mucilage capturing the antherozoids, which then penetrate to the central cell, or oosphere, and fertilise it. The now fertilised oospore acquires a cell-wall and forms an embryo, dividing into octants, of which the upper four form stem and cotyledon, the lower four, radicle and "foot," by which food is temporarily drawn from the prothallium.

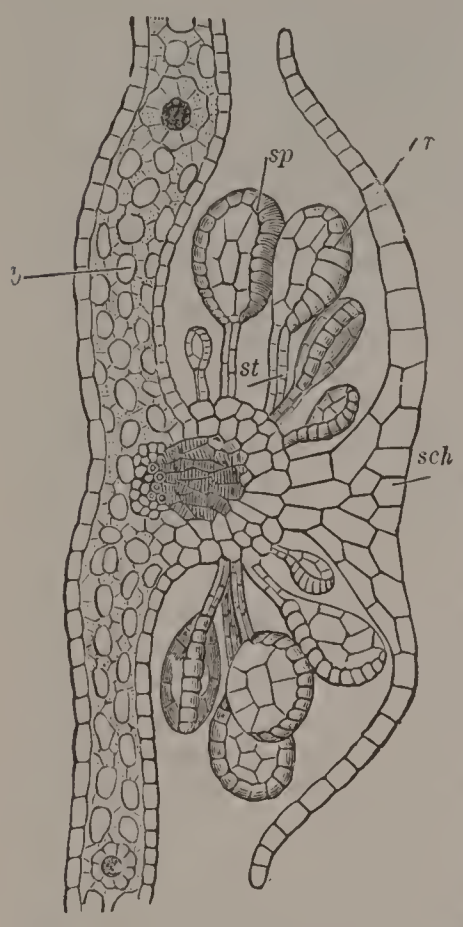
The sporophyte, or mature fern, is generally perennial, but varies in size from minute herbaceous "filmy ferns," an inch in height, with fronds only one cell thick, to the arborescent "tree-ferns" of the tropics, which may exceed 80 feet in height. The stem may be creeping and subterranean, as in the common bracken (*Pteris*), or may climb, as in *Lygodium*, with long internodes, or it may be erect and cylindric, as in the tree-ferns. It has a single apical cell; its cortex is often thickened, and bands of sclerenchymatous dark-coloured tissue give it strength. The "vascular" bundles in the larger stems form a regular cylinder of a network of anastomosing bands, each with a central xylem rarely containing true vessels, but mainly composed of scalariform tracheides, and with true sieve-tubes in the phloem.

The roots are usually numerous, and may completely cover the base of the stem, each root having a root-cap. The leaves or "fronds" are invariably stalked, and present a more varied range of form than those of any other group of plants, being simple in the hart's-tongue (*Scolopendrium*), and many times pinnate in others, and varying in size from an inch to 10 or 20 feet. The veins in the leaves are generally *furcate*, bifurcating repeatedly, and not as a rule meeting again; and the *circinate* vernation, or rolling up of the leaflets and leaves from their points, is very characteristic. Several species freely produce adventitious buds and plantlets on their fronds, as in *Asplenium viviparum*, *A. bulbiferum*, and *A. proliferum*. Though not as a rule, there is sometimes a marked difference between the "fertile," or spore-bearing, fronds and the "barren" ones, the former having less cellular tissue, as in the hard fern (*Lomaria Spicant*) and the elk's-horn (*Platycerium*). The sporangia are generally on the under surface of the frond, and are variously grouped. In the so-called "flowering ferns," such as *Osmunda*, they are only produced on the upper part of the frond, where the cellular tissue is undeveloped. On the stems and leaf-stalks of ferns brown multicellular hairs and plate-like chaffy scales, or *paleæ*, frequently occur.

UNDER SIDE OF PINNULE OF SHIELD FERN (*Aspidium*), showing the sori covered with discoid indusia.

The *sporangia*, or spore-cases, are of the nature of trichomes, or modified hairs, each originating from one epidermal cell (*leptosporangiate*), and consisting of a stalked capsule with walls one cell thick. A ring or group of thick-walled cells

(*annulus*) generally crosses it, and by its elasticity bursts the sporangium and liberates the spores. The sporangia are generally grouped together in rounded or linear clusters known as *sori*, each sorus being sometimes covered by a membranous outgrowth from the epidermis, the *indusium*, or by the inrolled margin of the frond. Ferns are *isosporous*, having only one kind of spore.



MAGNIFIED SECTION THROUGH PART OF FROND AND SORUS OF SHIELD-FERN (*Aspidium*).

b, Mesophyll of leaf; *sp*, sporange; *st*, stalk; *r*, annulus; *sch*, indusium.

There are six chief orders: — (i) POLYPODIACEÆ, with an incomplete vertical or marginal annulus, the largest order, including *Adiantum*, *Pteris*, *Lomaria*, *Asplenium*, *Scolopendrium*, *Aspidium*, *Lastrea*, *Polypodium*, *Platycerium*, *Ceterach*, *Dicksonia*, and *Davallia;* (ii) CYATHEACEÆ, with a complete oblique annulus, including most tree-ferns, such as *Cyathea* and *Alsophila;* (iii) GLEICHENIACEÆ, with a broad complete transverse annulus and naked sori, as in *Gleichenia;* (iv) HYMENOPHYLLACEÆ, the filmy ferns, with marginal sori in cup-shaped indusia, including *Hymenophyllum* and *Trichomanes;* (v) OSMUNDACEÆ, with unsymmetrical sporangia having obliquely apical groups of annulus cells, including *Osmunda* and *Todea;* (vi) SCHIZÆACEÆ, with ovoid sessile sporangia having apical annuli, including *Aneimia*, *Schizæa*, and *Lygodium*.

Ferns are distributed over the whole globe, from the equator to the arctic zones, abounding in moist warm climates and, therefore, in insular floras. In the tropics many are epiphytes, and most tree-ferns belong to the same region. Fossil ferns occur in the Old Red Sandstone, abundantly in the Coal-measures, and in more modern rocks. Few species have any economic value, the paleæ of some being used to stuff cushions, and the male fern, *Nephrodium Filix-mas*, as a vermifuge; but their beauty, and the ease with which they can be cultivated, render the whole group favourites in our gardens. There are some 3,000 known species.

Ferrar, NICHOLAS (1592–1637), a religious enthusiast, was educated at Clare Hall, Cambridge, of which society he became fellow in 1610. He then studied medicine for five years upon the Continent, and afterwards set up as a merchant in London. In 1624 he was returned to Parliament, and the next year he established a religious community at Little Gidding in Huntingdonshire, taking deacon's orders in 1626. The little community of 30 was made up of himself, his brother, his brother-in-law, and their families. Their work of bookbinding was combined with many services and much prayer. Charles I. visited them in 1633, and again in 1642. The fellowship was broken up by the Puritans. An account of the community will be found in *John Inglesant*.

Ferrara, formerly a lordship and later a duchy of Romagna in Italy. The House of Este held it as a Papal fief till 1597. After many changes of fortune and condition, the greater part of it reverted to the Papal throne in 1814, and in 1860 it passed to the King of Italy, and now forms the province of Ferrara. Its capital, of the same name, is a well-built town, enclosed by a wall, 7 miles round, on a fertile plain near the Po, but it has fallen into decay. It is an archbishopric, and the cathedral and churches contain some interesting paintings and sculptures. There are a public gallery of paintings, a school of medicine and of jurisprudence, and a large public library. Here Ariosto was educated, and spent his latter years; and a cell is still shown where Tasso was imprisoned. There are tanneries and silk and glass works.

Ferrara, ANDREA (16th century), was born at Belluno in North Italy. He, with his brother, was renowned for the forging of sword blades, which had a European reputation. Some think that the brothers were Spaniards, others that they were Italians originally from Ferrara; and they are said to have had the secret of tempering blades from Damascus.

Ferrari, GAUDENZIO (1484–1549), a painter of the Milan school, who studied under Giovannone. In 1504 he went to Florence, and came under the influence of Raffaelle. In 1524 he was appointed to execute a fresco of the *Crucifixion* in the Chapel of Sacro Monte at Varallo in Piedmont, some of the figures of which are modelled in relief. He painted many subjects, most if not all sacred. His *Glory of the Angels* is at Saronno, near Milan.

Ferrari, PAOLO (1822–1879), an Italian dramatist, born at Modena. His first comedy was produced in 1847. His style is sparkling, and much resembles a French style. *Goldeni* was produced in 1852. In 1860 he was made Professor of History at Modena and in the Academy of Milan. His works have been collected into fourteen volumes.

Ferrates, salts of "ferric" acid, H_2FeO_4, which has not at present been isolated. The potassium, barium, and a few other salts have, however, been prepared.

Ferret (*Putorius furo*), a domesticated albino variety of the polecat (*P. fœtidus*), bred in Europe and America for killing rats and driving rabbits from their burrows. It is about 14 inches long exclusive of the tail, with yellowish-white fur and characteristic pink eyes, and invariably breeds true except when mated with the wild form, when the young partake of the characters of both parents. The variety probably arose in southern Europe or

Africa in classic times, when the polecat or the marten was kept as a mouser. When used to drive rabbits from their burrows, ferrets are muzzled or held in a leash ; without this precaution they would probably gorge themselves with blood, and sleep till thirst compelled them to come out. They are also employed to kill fowls for the table, which they do very neatly with a single bite. Ferrets can never be called "tame," and show no affection for their masters, who, however, handle them fearlessly and are rarely bitten. But these animals never lose their thirst for blood, and there are instances on record of their attacking children in the cradle with terrible effects.

Ferric Salts are salts of iron corresponding to ferric oxide (Fe_2O_3). When anhydrous they are usually colourless, but are of a yellow or brown colour when combined with water. The most important salt is *ferric chloride* $FeCl_3$, which forms iron-black crystals, very deliquescent, dissolving to a brown liquid. Ferric salts may be readily distinguished by giving in solution a fine blue precipitate with potassium ferrocyanide and a blood-red coloration, even in dilute solutions, with ammonium sulphocyanate.

Ferricyanides, Ferrocyanides, the salts respectively of *hydro-ferricyanic* acid $H_3Fe(CN)_6$ and *hydro-ferrocyanic* acid $H_4Fe(CN)_6$. Although the acids themselves are unimportant and rather unstable, many of the salts are important compounds. Potassium ferrocyanide $K_4Fe(CN)_6$ is known commercially as *yellow prussiate of potash*. It is obtained by heating crude potash, iron filings, and animal matter—such as leather, horn, dried blood, etc., in large iron pots. The mass is extracted with water, and the yellow prussiate purified by recrystallisation. It forms large yellow monoclinic crystals, which are not poisonous. It is largely used in chemistry, as it is the source from which almost all the *cyanogen* compounds are derived. It is also used as a test for ferric compounds, yielding with these salts in solution a blue precipitate—Prussian blue. Potassium ferricyanide $K_3Fe(CN)_6$ is known as *red prussiate of potash*, and is manufactured by passing chlorine through a solution of the yellow prussiate $K_4Fe(CN)_6 + Cl = K_3Fe(CN)_6 + KCl$. It forms dark red, easily soluble crystals. It is a powerful oxidiser, and is of frequent use in the chemical laboratory and in photography. With solutions of ferrous salts it gives a blue precipitate closely resembling Prussian-blue and Turnbull's blue, probably ferrous ferricyanide, $Fe_5(CN)_{12}$.

Ferrier, DAVID, physician, was born at Aberdeen in 1843, and educated at the university there, where he graduated in 1863. He then studied at Heidelberg and at Edinburgh. He was afterwards appointed Professor and Physician at King's College, London, and became F.R.S. in 1876. His speciality is the brain and epilepsy, and he employs vivisection. In 1876 he published *Functions of the Brain*, and in 1878 *Localisation of Cerebral Disease*, and is the editor of *Brain*.

Ferrier, JAMES FREDERICK (1808–1864), a Scottish metaphysician, was born at Edinburgh, and was educated at Edinburgh and Oxford, and was called to the Scottish bar in 1832. He abandoned law for literature, and contributed to *Blackwood's Magazine*. These contributions showed him to be a man of mark, and in 1845 he was elected Professor of Moral Philosophy at St. Andrews. His best-known work is the *Institutes of Metaphysic*, and his lectures on Greek philosophy were published two years after his death.

Ferrier, SUSAN (1782–1854), a Scottish novelist, was born at Edinburgh, where she spent the greater part of her life, her father having been a Clerk of Session along with Sir Walter Scott. She often visited Abbotsford, and was a great favourite of Scott. Her three novels, *Marriage* (1818), *Inheritance* (1824), and *Destiny* (1831), besides showing great humour and power of arranging plot and incident, are of great value as representing the habits and manners of the Scottish upper middle class while it was still Scottish.

Ferrol, a Spanish town on the N. side of a bay in the province of Corunna, and 12 miles N.E. of the town of Corunna. The bay is entered by a narrow and well-fortified channel, and forms a magnificent harbour. There is a fine arsenal, and swords, cutlery, and military and naval equipments are largely manufactured. The chief imports are steel, yarn, silken and woollen goods, timber, and colonial produce ; the chief exports are agricultural produce.

Ferrotype, a photographic process used for the formation of a positive picture without the previous formation of a negative. [PHOTOGRAPHY.] The process is carried out in the following manner: A thin sheet of blackened iron is coated with an even layer of "*iodised*" collodion—*i.e.* collodion containing some iodide and bromide of silver in solution. It is then immersed in a solution of silver nitrate, and is ready for exposure in the camera. The image is usually developed by a solution of ferrous sulphate, and in those parts where the light has acted a deposit of silver of a white or grey colour is produced. The shadows are represented by the black iron showing through the collodion. The plate is fixed by a solution of potassium cyanide, which dissolves away the unaltered silver salts. The process is one very largely used by itinerant and sea-beach photographers, as the photographs, though not usually of high artistic merit, can be taken, developed, dried, and completed in a few minutes.

Ferrous Salts, iron salts corresponding to ferrous oxide FeO, as, *e.g. ferrous sulphate* $FeSO_4$ (known commercially as copperas). They are usually colourless when anhydrous, but when combined with water are usually green or blue. They rapidly oxidise when exposed to air, forming ferric salts. They are recognised in solution by giving a fine blue precipitate with potassium ferricyanide.

Ferry (from A.-S. *faran*, to go), a passage by boat over water. Foot-passengers are usually conveyed in rowing-boats, horses and carriages in flat-bottomed barges, with a sloping surface at one end to facilitate landing. The barges are either rowed

or drawn over the river by means of a rope, which passes over pulleys or through rings fixed to the barge. The ferryman propels the barge by pulling the rope. If the distance be great, steam-ferries are now commonly used.

A *flying-bridge* is a kind of ferry-boat used in military operations. The boat is attached by a rope to a buoy in the middle of the river, and steered in an oblique direction, so that, owing to the force of the current meeting its side, it tends to take a course at right angles to its length. Meanwhile the rope draws it towards the buoy, the result of the combined forces being that it moves with the buoy as centre, and so passes over the river.

Ferry, JULES FRANÇOIS, a French statesman, was born in the Vosges in 1832. He was called to the Paris bar in 1854, and in politics opposed the Court party. He wrote in the *Temps*, where appeared his *Comptes Fantastiques d'Haussmann*. In 1869 he was a member of the Corps Législatif, and voted against the war. During the siege of Paris he was a member of the Government of National Defence, and in 1872 he was appointed Minister to the Court of Athens. In 1879 as Minister of Public Instruction he was instrumental in the expulsion of the Jesuits; and he was Prime Minister in 1880–81, and again in 1883–85. He has always advocated a "forward policy" in colonial enterprise. It was he who established the French protectorate in Tunis in 1881; and in his second Ministry the war in Madagascar and Tonquin led to the fall of his Cabinet and his own retirement from public life with the nickname of "Le Tonkinois."

Fertilisation, a term commonly applied in botany to the processes by which the pollen of flowering-plants is conveyed to the stigma. These are preferably termed pollination (q.v.), the term fertilisation being restricted to those processes which more immediately precede and accompany the union of the two reproductive cells in true or sexual reproduction. Among flowering plants these processes may be delayed for hours, or even for months, after pollination. In their simplest condition the sexual cells seem not to differ from cells capable of asexual reproduction. In *Ulothrix*, for instance, one of the lower algæ (Confervoideæ), small ciliated protoplasmic bodies are produced (micro-zoospores), which may either germinate directly, or may unite in pairs fusing into a *zygospore*, which grows into a new plant. This union of similar sexual bodies is termed *conjugation*, and the bodies so uniting are called *gametes*—*planogametes* when ciliated, *aplanogametes* when not so. In somewhat higher groups of algæ the gametes lose all power of direct germination without conjugation, thus becoming purely sexual: they differ in size, the female being the larger; and the female is not ciliate, or loses its cilia at an early stage. This female gamete is then termed an *oosphere;* the unicellular organ producing it, the *oogonium;* the male gametes, *antherozoids;* the organ producing these, generally in large numbers, the *antheridium;* the fusion of these gametes, *fertilisation;* and its product, an *oospore*. Among the Conjugatæ, cells from two filaments lying side by side put out protuberances, which meet and become confluent. In *Mesocarpus* their nucleated protoplasmic contents contract, pass into the connecting tube and coalesce into a zygospore. In *Spirogyra* the contracted contents of one (male) cell pass right over into the other cell, so that the zygospore is formed there. In the Florideæ, which are the most highly organised algæ, the antherozoids having no cilia are termed *spermatia*, and the female organ, or *carpogonium*, is sometimes multicellular and terminates above in a tube known as the *trichogyne*. The spermatia are carried by water to this triochogyne, their contents enter it, and numerous *carpospores* originate by cell-division within the carpogonium.

Among fungi conjugation of planogametes, like those of *Ulothrix*. occurs among the Chytridiaceæ, and conditions like those of Mesocarpus in the common mould *Mucor*. In the higher moulds, the Peronosporeæ and Saprolegnieæ, the antheridium or *pollinodium* puts out a tube which pierces the oogonium and protoplasm from the former enters the latter and coalesces with the oosphere. The higher Ascomycetes, including nearly all lichens (q.v.), resemble the Florideæ in having spermatia. carpogonia, and sometimes trichogynes, and fertilisation results in the growth of a more or less complex fructification containing carpospores or *ascospores*, so-called because produced eight together in club-shaped *asci*. Among both algæ and fungi occur lowly forms without sexual reproduction, and higher forms in which the reproductive organs are functionless, and reproduction is apogamous.

Mosses, ferns and their allies, and gymnosperms are united under the name Archegoniatæ, because they have their single oosphere within a multicellular receptacle, or *archegonium*, which opens above, and gives entrance in the first two classes to ciliated antherozoids. In gymnosperms, and still more among angiosperms, the archegonium is reduced, and the male organ is the *pollen-tube*, the protoplasm of which does not break up into antherozoids. In the microspore or pollen-grain of flowering plants the protoplasm divides into two cells, the *vegetative* and the *reproductive*. Among gymnosperms the former divides into several *included cells* with distinct walls; but among angiosperms this is not so, and the nuclei of both cells commonly pass down into the pollen-tube when it is protruded, the reproductive nucleus undergoing division. In angiosperms the pollen-tube grows from the stigma, where the pollen-grain adheres, down the stylar canal into the ovary and into the micropyle of an ovule, where it may have to pierce some perispermic tissue before reaching the embryo-sac (megaspore); but in gymnosperms the pollen-grain is carried directly into the micropyle at the bottom of which it slowly protrudes its tube through some thickness of tissue before reaching the *neck*, *rosette*, or *stigmatic cells* of the *corpuscula*, or archegonia at the apex of the embryo-sac. Among angiosperms these are represented only by the *egg-apparatus* of three cells, the oosphere and two *synergidæ*, at the apex of the embryo-sac. The wall of the embryo-sac is absorbed, and apparently

part of the protoplasm of the pollen-tube, with one or more reproductive nuclei, passes through its mucilaginous wall. A second nucleus (the *male pronucleus*), which no doubt is this generative nucleus, now appears in the oosphere and coalesces with its nucleus (the *female pronucleus*). In some cases one of the synergidæ appears to play a part analogous to that of a trichogyne. The fertilised oosphere acquires a cell-wall, and by division gives rise to the suspensor and embryo. In most Florideæ and Ascomycetes, as a result of fertilisation, adjacent cells grow up round the carpogonium forming a "fruit" or *cystocarp ;* and among Phanerogams, not only do the *carpels* or *female sporophylls* enlarge around the fertilised seed, but in some cases other floral leaves and axial structures become modified so as to contribute to the *fruit*. [FLOWER, FRUIT, POLLINATION, SEX.]

Fescennine Verses, a kind of jeering verse dialogue, usually in the Saturnian metre, carried on by the country folk of ancient Italy at their harvest celebrations and other festive gatherings. They are believed to have taken their name from Fescennium, a city of Etruria.

Fesch, JOSEPH (1763–1839), Cardinal and Archbishop of Lyons, was Napoleon's maternal uncle. He was commissary of war to the Army of the Alps under General Montesquieu after the Revolution, and again to his nephew's Italian army in 1796. In 1801 he returned to his ecclesiastical condition, and in 1802 became Archbishop, and the next year Cardinal and French ambassador to the Papal Court. His ultramontane views displeased the Emperor, who sent him to a kind of exile at Lyons. In 1814 he went to Rome, and after the Hundred Days, during which he returned to France, he again retired to Rome. He refused to resign his episcopal rights till forced to do so by the Pope, and he finally died at Rome.

Festivals. The religious feasts of savage races are connected with ancestor worship, and among the civilised nations of antiquity there still existed some festivals of this primitive character, but the worship of nature early prevailed both among the Semites and Aryans. The changes of the seasons brought to mind the personified forces supposed to control them, and a regular succession of ceremonial observances became established from year to year. Even where—as among the ancient Greeks—nature-worship degenerated into mere polytheism, the character of the festivals pointed to the origin of the gods in whose honour they were held. The tendency is innate in human nature, for, on the discovery of the New World, the same worship was found to exist among the Peruvians and Mexicans. The latter had a remarkably full calendar, with many movable and immovable feasts. Among the races of the Old World the ancient Persians alone possessed a form of worship entirely void of religious symbolism.

In Homer there are a few scanty allusions to festivals marking the progress of the year; in the Homeric hymns and Hesiod the number is greatly increased, so that a fuller ritual must have grown up in the intervening period. By the age of Pericles it had reached its full development, and the number of days on which all public business, including the administration of justice, was suspended, amounted to about a sixth part of the entire year. Among the more famous Greek festivals may be mentioned the two *Panathenæa*, in honour of Athene, the four *Dionysia* in honour of Bacchus, and the Eleusinian mysteries. Of a different character were the great national meetings at the Olympic, Pythian, Isthmian, and Nemean games, when the religious gathering was made an occasion for literary, artistic, and, above all, athletic contests.

The Roman calendar recognised a division of the year for religious purposes into *dies festi* and *dies profesti*. The former were *feriæ* or public holidays, on which the festivals of the gods were held, public business was suspended, and slaves enjoyed an intermission of their toil. They were of three kinds, according as to whether they were held annually on a fixed day, observed every year at a varying time selected by the priests or magistrates, or enjoined in consequence of some exceptional circumstance. The first class included some of the principal Roman feasts. Among the oldest of these were the *Lupercalia*, in honour of Lupercus, god of fertility, the *Palilia*, in honour of Pales, god of shepherds, and the *Saturnalia* or festival of Saturnus, which eventually extended over seven days in December. Some festivals were called *ludi* in consequence of the "games," such as theatrical representations, chariot-races, and gladiatorial combats, which accompanied them. Of the festivals, the days of which might be changed, the most important was the *Feriæ Latinæ*, originally an assembly of the whole Latin nation on the Alban Mount, but afterwards converted into a Roman holiday. As the consuls could not take the field before they had held the *Latinæ*, the magistrates who had charge of the festival could hasten or retard public business by choosing an early or late date for its celebration. It was part of the Roman policy to adopt the gods of conquered nations, so that the number of festivals greatly increased during the later years of the Republic. Among late introductions were the *Megalesia*, the festival of the Phrygian goddess Cybele, who was first worshipped at Rome in 203 B.C., and the *Ludi Apollinares*, or "games of Apollo," established in 213 B.C.

The festivals of the Hebrews differed widely from those of other ancient races, since they were all directed to the worship of one Supreme Being. They fall into three classes—the Sabbath and the festivals connected with it in idea; the great annual festivals of the Passover, Pentecost, and Tabernacles; and the Day of Atonement. The first class comprised the Feast of Trumpets on the first day of the seventh month, the Sabbatical (or seventh) Year, when the land was left untilled and its produce belonged to the poor, and the Year of Jubilee, celebrated at intervals of seven times seven years, when land which had changed hands was restored to the family of its original owner, and all slaves of Hebrew descent were set free. The three

great festivals — especially those of Pentecost, Wheat harvest (or First Fruits), and Tabernacles (or Ingathering) were closely connected with agriculture, as is shown by their names and the offerings by which they were accompanied. They also commemorated great historical events, but this was probably a new feature introduced by Moses. The influence of the mystic number 7 in the arrangement of the whole Hebrew calendar is very remarkable. After the return from Babylon two new festivals were added—those of Purim and Dedication.

Among the Christians of the apostolic age there were no sacred days except the Sabbath, which was henceforward celebrated on the first day of the week. For a long time, however, Saturday as well as Sunday was observed in places where Jewish influence predominated. It was not till the latter part of the 2nd century that the *Pascha Staurosimon* (corresponding to Good Friday) and the *Pascha Anastasimon* (Easter), which took the place of the Passover, were recognised throughout the Christian Church. In the same way the Jewish Pentecost soon afterwards became the Christian Whitsunday. During the 4th century Epiphany and Christmas Day were added to the list, and the observance of Ascension Day seems to have become general at about the same time. From this time onwards there was a growing tendency to increase the number of festivals. Days were set apart for the worship of the Blessed Virgin, and others were consecrated to apostles, saints, and martyrs. The change was doubtless due in part to a desire to attract pagans accustomed to the gorgeous ceremonial of heathen temples; but it was highly detrimental to the purity of the Christian religion, while the enforced cessation of work and the character of the festivities carried on in churches (which often pandered to the lowest tastes of the populace) exercised a pernicious influence both on public life and private morality.

At present there is a separate office for each of the numerous festivals of the Roman Catholic Church. The number observed by the Greek Church is even larger, as several patriarchs and prophets find a place in their calendar.

The chief Mohammedan festivals are the 'Eed-el-Kabeer (great festival) and the 'Eed-el-Shagheer (minor festival), which follows the fasts in the month Ramâdan. Others commemorate the birth of the prophet, his ascension into heaven, and similar events.

Festus, Sextus Pompeius (probably about 300 A.D.), a Roman grammarian, who wrote a kind of Latin dictionary—an abridgment of one by Verrius Flaccus—which is valuable for the light it throws upon Latin etymology. Only one MS. of his work is known to exist. A good edition was produced at Göttingen in 1839 by K. O. Müller.

Fetch, a wraith, a double (q.v.).

Fetichism, the belief in or doctrine of fetiches. The term *fetich* (from the Portuguese *feitiçâo* = magic) was introduced by de Brosses (q.v.) in the 18th century, to describe what were supposed to be the gods of some of the peoples of West Africa, and afterwards it was used as a substantive. Professor Waitz says that the negro believes that "a spirit dwells, or can dwell, in every sensible object, and often a very great and mighty one in an insignificant thing. This spirit he does not consider as bound fast and unchangeably to the corporeal thing it dwells in, but that it has its usual or principal abode therein. The negro, indeed, in his conception, not uncommonly separates the spirit from the sensible object which it inhabits; he even sometimes contrasts the one with the other; but most usually combines the two to form a whole, and this whole is (as Europeans call it) the 'fetich,' the object of his religious worship." The native name is *grigri*, or *juju*, and the use of the word "fetich" is confined to Europeans. The objects in which a spirit is supposed by the natives to dwell are classed by Tylor as "rubbishy trifles:" "stones, claws, bones, a pot with red earth and a cock's feather stuck in it, pegs wound over with yarn, red parrots' feathers, men's hair, and so forth." The possession of a fetish is thought to give its owner power over the spirit inhabiting it; and Sir John Lubbock defines fetichism as "that stage of religious thought in which man supposes he can force the deities to comply with his desires." The negro worships his fetich, and pours copious libations of rum over it, as long as he supposes that it brings him good fortune; but when it ceases to do this he will discard it for something else which he thinks more powerful.

Fétis, François Joseph (1784–1871), a Belgian composer, was born at Mons, and educated at the Paris Conservatoire, where, after being for some time organist at Douai, he was professor from 1818 till 1833. In that year he was appointed Director of the Brussels Conservatoire. He has written, besides his operas, sacred music, violin pieces, etc., a treatise on *Fugue and Counterpoint*, a *Universal Biography of Musicians*, a *Manual for Directors of Orchestra and Military Bandmasters*, and a treatise on the *Theory and Practice of Harmony*.

Fetzara, a mixed Arabo-Berber tribe, province of Constantine, Algeria, in the hills of the Seybouse basin, south-east of Guelma. Originally the Fetzara were pure Arabs of the Ghatafân family, who formerly roamed the steppes of Cyrenaica, passing thence through Tunisia to Algeria, where they became amalgamated with the surrounding Berber populations. They give their name to the large lake or salt lagoon of Fetzara, which is supposed to have been formed by underground disturbances since their arrival in the country.

Feu, or Few, a free and gratuitous right to lands made in consideration of services to be performed according to the proper nature thereof. Feu in Scots law means vassal tenure, as against wardholding or military tenure, being that holding where the vassal, instead of military service, gives a return in money, which is termed the feu duty or feu annual. In Scotland building land is usually granted on feu not on lease, so that the owner granting land for building has not, as in England,

a reversion, but grants the land in perpetuity in consideration of a perpetual annual rent-charge or payment. [FEUDAL SYSTEM.]

Feudal System, Feuds, Feudalism. The *Feudal System* may be described as a tenure of land founded upon Feuds which were introduced under the new dynasties founded by the barbarous tribes who during the 4th, 5th, and 6th centuries poured themselves from Germany and neighbouring countries into the Roman Empire. In every province which they subjugated, large tracts of territory were divided by lot among the conquerors, some portion falling to the king or general of the invading tribe, and the rest to his soldiers, who received their shares as free and independent property, subject only to the condition of bearing arms, as occasion might require, in the defence of the community from hostile aggression. Of the lands assigned to the sovereign of the tribe, certain portions were afterwards distributed by him among his adherents, and chiefly his courtiers or companions (*comites*), but the interest they derived under these grants was not strictly in the nature of property. It was of a beneficial or usufructuary kind only, a mere stipendiary return for services (usually of a military character) which they were expected to render to their master, and subject at some future period to resumption, the *proprietas* or actual ownership of the land being still considered as vested in the sovereign himself.

Some time elapsed after the feudal relation began to be known to Europe, before the right of inheritable succession was fully conceded. In its primitive state the possession was held at pleasure, or for a short term only; afterwards the tenure was for life, the lord resuming the land on the death of the tenant, and granting it out afresh. But at length the son of the tenant was permitted to succeed—an indulgence which was followed by the extension of the grant, first to the tenant and his issue (*i.e.* in fee tail) and finally to him and his heirs (*i.e.* in fee simple), the law marking out a course of descent, which enlarging by degrees, embraced his relations, lineal and collateral, male and female.

So long as the vassal's interest was either precarious or of a very limited duration, the property in the soil continued in the lord, whose condition was that of a landowner, while the vassal was a mere occupier. But the vassal on acquiring the right to hold the land for life, rose in estimation, and when at length he came to receive the pure and proper feudal donation to him and his heirs in perpetuity which left nothing in the lord but the chance of resumption on the failure of heirs, or the violation of some condition expressed or implied in the grant, the original proprietary right was exchanged for seigniorial honours, and both lord and vassal grew in dignity. A grant without words of succession was limited to the life of the grantee only—of such antiquity and so linked with history was the well-known rule which till recently required the express mention of heirs in order to convey the fee by deed. But an estate less than for life ceased, as we shall presently see, to be of any consideration as regards the feudal compact.

The tenant who under a grant to him and his heirs had acquired a permanent interest was competent to carve out various interests of less extent called in law particular estates—as (passing by holdings determinable at will) an interest to continue for any given number of years, or any other definite period of time, or for the life of the grantee or of another person; or for the life of the grantee with a capacity of transmission to his lineal heirs, male or female, or both (*i.e.* an estate tail). We recognise in these derivative interests the successive modifications which the tenancy underwent before it attained the hereditary estate, and which were initiated by the vassal, secure in the full possession of the fief. He did not stop there, but pursuing the precedent to its final result, even affected seigniorial rank.

Such is a brief sketch of the origin and establishment of the Feudal System, which bound together by a community of interest and duties the whole proprietary body. So strong, indeed, was that principle that it imposed upon the sovereign himself a legal necessity that all the landed possessions enjoyed by subjects of the realm should be holden either mediately or immediately of him. The system was not so much an invention of government applied systematically to the management of conquered countries, as a conventional arrangement of property, established by gradual usage and brought into general adoption by its tendency to protect persons of inferior rank from the inconvenience of civil disorder. At the same time it also tended to aggrandise the more powerful lords, and it also operated to maintain an effective force to repel hostile invaders.

The feud was conferred by words of gratuitous and pure donation, *dedi et concessi*, which would still be the operative words in a modern infeudation or deed of feoffment in the English law. [FEOFFMENT.]

This donation was perfected by the ceremony of corporal investiture, or open and notorious delivery of possession in the presence of the other vassals, which delivery perpetuated among them the era of the new acquisition, at a time when the art of writing was very little known, and therefore the evidence of property was reposed in the memory of the neighbourhood, who in case of a disputed title were afterwards called upon to decide the difference, not only according to external proofs adduced by the litigant parties, but also by the internal testimony of their own private knowledge.

Besides an oath of fealty or profession of faith to the lord, which is the parent of our oath of allegiance, the vassal or tenant, upon investiture, usually did homage to his lord.

Besides the fealty and homage, the relation of lord and vassal was ordinarily attended with the following feudal incidents:—(1) Aid; (2) Relief; (3) Fine on Alienation; (4) Escheat and Forfeiture. [*See* those Titles.]

The fabric of the Feudal System in England was shattered by the storm of the Civil War. The restoration of the king could not restore what had

thus been in practice swept away. By the statute 12 Charles II. c. 24, all tenures of any honours, manors, lands, tenements or hereditaments, or any estate of inheritance at the Common Law held either of the king or of any other person or persons bodies politic or corporate, were turned into free and common socage to all intents and purposes. It was not till after the lapse of nearly another century that the tenures and other institutions of feudalism were put an end to in Scotland by the statutes passed after the rebellion in the 20th year of the reign of George II.

Some of the consequences of tenures as they at present exist cannot be better exemplified than by the rules as to the forfeiture and escheat of lands, both of which have, however, undergone many modifications since the statute of Charles above referred to.

Feuerbach, Ludwig Andreas (1804–1872), a German philosopher, born in Bavaria. He studied divinity in Heidelberg, but being smitten with a love of philosophy he went to Berlin, where he attended Hegel's lectures. For a time he seemed to have adopted Hegel's principles, but he gradually worked himself free of them and took up an independent position. He supported himself by acting as a private tutor, but his publication of *Thoughts on Death and Immortality* (1830) disgusted the Government by its negation of personal immortality, and he was deprived of his position as *privat-docent*. He then married a lady possessed of some little property, and for some time lived a retired country life in the castle of Bruckberg. In after years he suffered a good deal both in body and estate. He may be looked on as representing the reaction from metaphysics to empiricism, and though he has had some influence upon German thought, made little impression outside his own country. Among his chief works are a *History of Modern Philosophy*, *The Essence of Christianity* (1841), and *Theogony* (1857).

Feuerbach, Paul Johann Anselm von (1775–1833), a German jurist, especially in the department of Criminal Law, was born at Jena, where his education began, to be continued later at Frankfort. At the age of 17 he entered the University of Jena, and after devoting himself for a time to philosophy he abandoned this for jurisprudence. He took his doctor's degree in philosophy in 1795, and in law in 1799. In this year he began to lecture at Jena, having already, in 1796, published a *Critique of Natural Law*. He then produced several works upon the theory of punishments and crimes. In 1802 he was appointed a professor at Kiel, and undertook the task of drawing up a criminal code for Bavaria, which was adopted in 1813, and became the base of several other codes. In 1817 he was nominated second president of one appeal court and first president of another. He interested himself much in Kaspar Hauser. Among his works are *Remarkable Criminal Trials* (2 vols.), and *Contributions to the Art of Law-making*. His son wrote a biograhy of him (1852).

Feuillet, Octave, a French novelist, was born at St. Lô, in the department of La Manche. He aided Dumas in literary work, and his first independent work was *Le Fruit Défendu* in *La Nouvelle Revue*. His *Scènes et Proverbes* and *Scènes et Comédies* represent about seven years' work, starting from 1848. In 1862 he was made an Academician, in which year he published *Sybille*, having already written in 1858 *Le Roman d'un Jeune Homme Pauvre*, which to the thinking of many is his best work, though others prefer the tender sentimentality of *Sybille*, which is a pretty picture of the old rural patrician life. To a pleasant style and delicate touch, Feuillet adds the qualities of delicacy and decency, though his tendency to sentimentality prevents his taking a very high place in the first rank of novelists. He wrote several other novels and comedies.

Feuilleton, the part of a political journal devoted to general literature, usually divided from the newspaper proper by a horizontal line. It originated in France, being first adopted by the *Journal des Débats* at the beginning of this century. It often consists of criticisms on art or literature, and many famous French novels made their first appearance in this form.

Fever, or Pyrexia, a diseased condition of the body characterised by undue elevation of temperature. The normal temperature of the body averages about 98·6° Fahrenheit, and although it undergoes slight variations according to the time of day, the ingestion of food, the amount of exercise taken, etc., these variations are confined within narrow limits, a very close equilibrium being maintained between the amount of heat produced by the oxidation of food taken into the body and the amount of heat lost by the lungs and skin and in the various excreta. In fever the temperature is raised above the normal; this appears to be in the main due to an increased production of heat by disintegration of the tissues, rather than to a diminution in the loss of heat from the body. If the temperature is raised only two or three degrees, the fever is said to be slight; if the thermometer indicates an increase to 103° or 104°, the fever is said to be high; while if the temperature exceeds that amount the condition is said to be one of *hyper-pyrexia*. Certain symptoms are usually associated with elevation of the body temperature. The fever is generally ushered in by shivering attacks or *rigors;* the skin is hot and dry; the pulse and respiratory movements are quickened; headache is common; vomiting may occur; the tongue is dry and coated; and the urine scanty and high-coloured. The termination of a febrile attack may be either by crisis or lysis. In the former case the temperature suddenly falls to the normal, in the latter the diminution of temperature takes place more gradually. The term *intermittent* fever is applied to those cases where there are several rises of temperature separated by intervals in which the normal temperature is registered. In *remittent* fever the temperature remains throughout the attack above the normal, but the degree

of elevation undergoes diminution or remission from time to time. In *continued* fever the elevation of temperature is fairly continuously maintained throughout the attack. *Hectic* fever is a fever of remittent or intermittent type, which continues for a long period of time and is associated with loss of flesh, sweating, and flushing of the cheeks; the term is especially applied to the fever which develops in the course of tubercular disease of the lungs and joints. Fever should be regarded as the name for the group of symptoms already described rather than as a disease in itself. It is not possible to do more than to refer briefly to the forms of disease in which fever occurs. They may be divided into two groups; in the first place, there are the specific febrile diseases (malaria, smallpox, typhus, typhoid, scarlatina, measles, etc.), and secondly there are all those maladies in which inflammation affects some part or organ of the body (pneumonia, pleurisy, abscess, etc., etc.).

Fez, a town in Morocco, of which it became part in 1548, and is now the second capital. It is situated about 100 miles E. of the Atlantic, and 80 S. of the Mediterranean, in an oval valley through which flows the "River of Pearls," dividing the town into the Old Town on the right bank, and the New Town on the left. The town is in a cultivated district, and presents a striking appearance from a distance, being surrounded with strong walls, which, however, are now falling into decay. There are many ruins of all kinds in the neighbourhood, and the hills to the S. are covered with groves of orange, olive, and other trees. The streets are narrow and dirty, and present blank walls to the passer-by, the windows and openings generally being towards the courts and gardens. The houses are lofty, and on a level with the first floor are roofs of reed or the like, the result being that the sun never penetrates into the streets, and the people have the reputation of being the palest of all Moors. Once Fez was a great seat of learning, but it is no longer so. There are two principal mosques, one of which has a court for women worshippers, and the other is a refuge for criminals. There are good gardens round the palace. The town is a depôt for the Barbary trade, and many caravans pass through it. The manufacture of fezzes were once a speciality, it being thought that the peculiar shade could not be manufactured elsewhere. This dye comes from a berry grown in the neighbourhood, and is used also in the preparation of morocco leather, much of which comes from Fez. The town was founded in 793 by Prince Edris, and became the capital of the Mahometan states of West Africa, and a very sacred city, which was often the object of pilgrimages. The Moors when expelled from Spain brought here their arts and manufactures. Though very hot in summer the climate is pleasant in winter. A road from Tangier (160 miles) is practicable for horses and camels. The population consists of Berbers, Arabs, negroes, and Jews, the last managing to thrive in spite of the persecutions to which they are subjected.

Fezzan, a country of the Sahara belonging to Turkey, and in the government of Tripoli. It extends for 390 miles from N. to S., and 420 from E. to W., and lies between lat. 30° 40′ to 24° 10′ N. and long. 10° 30′ to 18° 20′ W., and contains 156,000 square miles. It is crossed about lat. 28° N. by the Black Mountains, which are a volcanic mass in a plateau of white limestone, and reach a height of 2,982 feet. A peculiar feature are the shallow Trona lakes, which produce a kind of brine shrimp, which when made into paste much resembles red-herring in taste. The climate is, for the most part, regular, though it is at times very hot, and in winter the cold is at times considerable. But the country is dry and healthy, and there is next to no rain—a matter, however, of little importance, as plenty of water is to be obtained at a slight depth for irrigation and other purposes, and the roots of the large trees, such as the palm, penetrate to the water-bearing strata. Although there are five harvests a year, and plenty of fruit might be grown, the cultivation of the soil is a good deal neglected. The date is the chief food of the people, and of the animals, of which there are few besides the camel, fowls, pigeons, a few horses and sheep, and here and there an antelope. Views vary much as to the amount of population. The trade of the district is small. The jurisdiction is vested in a lieutenant-governor.

Fezzâni, the inhabitants of Fezzan, North Africa, between Tripoli and Lake Chad. They are variously estimated at from 50,000 to 200,000, sedentary in the oases, nomad in the intervening steppes. The latter are mainly Arabs belonging to the three great tribal groups of the *Riah* in the central districts between Sokna and Harûj; the Hotmân and the Megârha in the western district about the Wady esh-Shiâti and on the stony Hamâdas. West of Murzuk are the Kel-Tinâlkûm Tuaregs (Berbers) and other Tuareg clans in the south-west, while the northern tribes, such as the Guntarâr of the Wady Sofejîn, the Ulâd Bu-Sef, and the Urfilla are also Berbers more or less Arabised. The Ghariân and Nefûsa hills in the extreme north are still almost exclusively peopled by Berbers, though several nearly pure Arab tribes occupy the steppes between the Great Hamâda and the Ghariân hills. Of the settled populations of the oases the substratum is certainly Negroid, a mixture of Sûdanese negroes (Kanuri, Kanembu, Hausda, etc.) and Saharan Hamites (Tibbu of Tibesti and Tuaregs). They are of a somewhat repulsive type, very dark, with high cheek-bones, broad nostrils, small eyes, large mouth, broad, flat features, crisp or kinky hair. The dominant language is Arabic, though Kanuri and Hausda are also widely spoken owing to the constant stream of slaves arriving from Bornu, Sokoto, and other parts of Central Sûdan. The independent Hamite tribes all speak either various Berber dialects or Teda, that is, Northern Tibbu as current in the Tibesti uplands. (H. Barth, *Travels*, 1857; H. Duveyrier, *Exploration du Sahara*, 1864; Gerhard Rohlfs, *Quer durch Afrika*, 1874; Nachtigal, *Von Tripolis nach Fezzan*, 1878.)

Fiasco, literally a failure in a musical performance; hence, a breakdown of any kind. In Italy, when a singer makes a false note, the audience shout "*Olà. olà, fiasco.*" The allusion may be to the bursting of a bottle (*fiasco*, Eng. flask).

Fiber. [MUSQUASH.]

Fibres, thin threads of various origin, vegetable, animal, or mineral. Fibrous substances are mainly employed for four classes of purposes—for weaving into fabrics or textiles, as they are termed, for cordage, for paper-making, and for brooms and brushes. Asbestos (q.v.) is the only natural fibrous mineral substance of any economic importance. Fine metallic wires, though sometimes woven, are not usually considered as fibres commercially. Fibres of animal origin are few in number but of great economic importance. Silk (q.v.), the cocoon of various species of silkworm, and wool (q.v.), the fleece of the sheep, are the most important; but mohair (q.v.), Cashmere wool, and other forms of goat's-hair and alpaca (q.v.) are also extensively employed as textiles; horse-hair is both woven and used for stuffing; and the hair of the grey squirrel, the badger, the bear, the skunk, and the cow's ears are used for "camel-hair brushes," shaving-brushes, and gilder's brushes, as are hog's bristles for harder kinds of brushes. These animal fibres, being all albuminoid, burn with the smell familiar in burning feathers; but wool and hair contain sulphur, which silk does not. They all dissolve if boiled in a ten per cent. solution of soda, which vegetable fibres do not. Vegetable fibres are structurally of three classes, unicellular hairs on seeds, bast-fibres of Dicotyledons and fibro-vascular bundles of Monocotyledons. Cotton (q.v.) is the only member of the first class important as a textile, various so-called silk-cottons and vegetable-silks being used only for stuffing cushions, etc. The members of this class being unaltered and unthickened cellulose (q.v.) have less strength than the lignified members of the other two classes. Of the second class the most important are flax (q.v.), hemp (q.v.), jute (q.v.), and China-grass, rhea or ramie (*Boehmeria*) as textiles; sunn-hemp (*Crotalaria*) for cordage; the baobab (q.v.) for paper; and lime-tree and Cuba bast (q.v.) for mats and gardeners' purposes. Alfa (q.v.) or esparto grass, though a monocotyledon, is used whole, like flax, but is exclusively a paper material, not being, as are many other fibres, employed first as a textile and then worked up into paper from rags. Wood fibre, derived from aspen and other poplars, alder, spruce, and pine, which is now employed in increasingly large quantities as a paper material, though dicotyledonous, can hardly be classed here, since the whole tree, even leaves as well as wood and bark, and not the bast only, is used. Of the third class the chief are the New Zealand flax (q.v.) from the leaves of *Phormium tenax;* Manila hemp (q.v.) from those of *Musa textilis;* Sisal hemp and pita, from those of species of *Agave* (q.v.); pine-apple fibre, from those of the pine-apple (*Ananas sativus*); coir (q.v.), from the fruit of the cocoa-nut palm; and the "ramenta" at the base of the leaves of the Kitul, Piassaba, and Gomuti palms, which, under the name of "vegetable bristles," are now largely used for brooms, brushes, cables, etc. Brush-grass, or chien-dent, the wiry rhizomes of the South European grass *Chrysopogon Gryllus,* and broom-corn or brush, the dried fruit-stalks of the various species of *Sorghum* (q.v.) grown for their grain in the United States, especially by the Shaker communities, are also important as material for brooms. Besides these, many other fibres are employed locally for these purposes, for stuffing cushions, for cordage, or even for native textile manufactures. Though the inexhaustible wood-supply of the world may provide for the paper-manufacture, or for all but the very best, constant search is made for new fibres that in length, strength, fineness, elasticity. and colourlessness are suitable for woven fabrics in the first place, and subsequently to make rags valuable for the best paper.

Fibrin is a substance which is formed during the coagulation of blood. It does not exist ready-made in the living, circulating blood, but in certain diseased conditions, and when the blood is shed, fibrin formation occurs, and to the peculiar physical properties of the substance the phenomena of coagulation are in the main due. Fibrin is composed of a meshwork of fine white, highly-elastic fibrils which entangle and enclose the red blood corpuscles. Shortly after the appearance of the fibrils, they contract and squeeze out the fluid portions of the coagulated mass, which thus becomes obviously divisible into two parts: the solid *clot*, and the expressed fluid or *serum*. Fibrin may be obtained, freed from red corpuscles, by whipping recently shed blood with a bundle of twigs. The fibrin adheres to the twigs and can thus be separated in a nearly pure state. It is found to be a body allied in chemical composition to the group of substances known as Proteids (q.v.). The causes of its development in shed blood, and the reasons why fibrin formation should not occur in the circulating fluid, are but ill understood. [BLOOD.]

Fibrospongiæ, the group of the sponges including those in which the skeleton is not calcareous. As in other sponges (q.v.), the skeleton consists of a series of spicules; in this group the spicules are either siliceous or of the soft fibrous material known as spongin: the latter series include the common sponges of commerce, and the former the siliceous sponges, which are typically of deep-sea habitat. There are four divisions, the *Hexactinellidæ* (q.v.), the *Tetractinellidæ* (q.v.), the *Monactinellidæ* (q.v.), and the *Keratosa*. [SPONGE.]

Fibula, the long slender bone situated on the outer side of the leg, its head or upper extremity articulates with the tibia, but does not enter into the formation of the knee-joint, its lower extremity articulates with the astragalus, one of the bones of the ankle.

Fichte, JOHANN GOTTLIEB (1762–1814), a German philosopher, was born in Lusatia. He was

educated at a Saxon royal school, and studied at Jena, Leipzig, and Wittenberg, and then spent some time as a *privat-docent*, enjoying meantime the society of Kant. At Königsberg in 1792 he published an *Essay of Criticism of all Revelation*, and this procured him a Professorship of Philosophy at Jena. In 1800 appeared his *Theory of Science*, which was founded upon Kant. Being suspected of atheistical views on account of an article he wrote in his *Philosophical Journal*, he resigned his professorship, and went into private life at Berlin, in which city, after the close of the war between Prussia and France, he was appointed Professor of Philosophy (1810). In 1813, when the war with France had begun again, Fichte's wife aided in nursing the sick and wounded French and Prussians in the hospitals, and caught hospital fever, of which she died; and Fichte, who had nursed her, likewise caught it and died. In philosophy he is the offspring of Kant, but he completes the idealistic development which Kant himself rejected. He divided things into the thinking (absolute) ego, and the non-ego created by the thinking ego, a perfect idealism; while in practical ethics he both taught and practised virtue, integrity, and self-denial. His *Closed Commercial State*, a protest against all foreign trade, is an unintentional *reductio ad absurdum* of Protectionist views. He gave a great stimulus to German patriotism. Many of his works have been translated into English, and his son published his biography and literary correspondence.

Fichtelgebirge, a mountain group of Bavaria, forming the centre from which extends the Erzgebirge in the N.E., the Frankenwald in the N.W., and the Böhmerwald in the S.E., determining the course of the Eger E., and the Saale N. to the Elbe; the Main W. to the Rhine, and the Naab W. to the Danube. Its chief heights are the Schneeberg (3,490 feet) and the Ochskopf (3,340 feet). The country is thickly populated and well wooded; and among the productions are iron, copper, vitriol, sulphur, lead, marble; and mother-of-pearl is obtained from the streams. Iron-mines, forges, blast-furnaces, and charcoal-burning provide occupation for the people. A watering-place called Alexandersbad is coming into vogue as a pleasure and health resort.

Ficino, Marsilio (1433–1499), an Italian philosopher and ecclesiastic born at Florence. His early talent came to the notice of Cosmo de Medici, to whom Ficino's father was physician. Cosmo had the boy educated, and set him to translate *Plato and the New Platonists* into Latin, and to aid himself in founding a Platonic Academy later. Ficino considered Platonism, which he did not always distinguish from Neo-Platonism, as at one with Christianity, and was somewhat given to mystic views and interpretations. He entered the Church in later life, and was made rector of two churches and canon of the cathedral of Florence. His chief work is *Theologia Platonica: de immortalitate animorum ae æternâ felicitate.* In this he advocates the immortality of the soul.

Fictions in English law have abounded, and they have been somewhat cynically defined as "those things that have no real essence in themselves, but are acknowledged and accepted in law for some especial purpose." These especial purposes are various. The law (by which must be understood those who, for the time being, are the expounders and interpreters of it), it is said, shall never make any fiction but for necessity and in avoidance of a mischief (Coke's *Reps.* vols. iii.–xxx.). This is equivalent to saying that those who interpret the law will, in order, to avoid a special hardship, or remove some unexpected difficulty not provided for by the law, resort to a fiction—that is, they will assume something to be which is not. It has been remarked that these fictions have always a good result in view, a result, that is, considered good by those who make or maintain the fictions. Fictions of law must not be of a state of things impossible, but the reason for this is somewhat curious, "for the law unites nature." Under this head there is a canon of law, "that a man shall never be subject to the penalty of a statute by a fiction." The following are a few of many instances. The old action of Ejectment was founded upon a fiction, the names of the nominal Plaintiff and Defendant being purely fictitious [Ejectment]; the levying of a fine as a mode of conveyance of real estate, now abolished [Fine]; the action in which a father recovers damages for the seduction of his daughter is to the present day founded upon the "loss of her services." Many fictions, so far from being injurious, have often been beneficial, but their existence indicates a defect which it is the business of legislation to remedy, and many of them have been remedied during the present and preceding reigns.

Field, in *Physics*, signifies any portion of space through which stress is transmitted. A book in the middle of a room possesses weight—that is, gravitational stress is transmitted mutually between the book and the earth. The space between is therefore part of the field of gravitation. A piece of iron brought near the poles of a magnet is acted on by a definite force; the iron is thus in a magnetic field. A field must evidently possess a medium for the transmission of the stress, either gravitational, magnetic, electric, or other. This medium must exist even when all ordinary matter is absent. It is called the *ether*, and its properties are being gradually discovered by studying the nature of the stress, and of its transmission. [Ether.]

Field, Cyrus West, was born in Massachusetts in 1819. After starting a prosperous paper factory, he took up the idea of having an Atlantic telegraph cable, and having obtained a concession for fifty years from the Government of Newfoundland, he (with others) founded in 1854 the New York, Newfoundland, and London Telegraph Company, and the Atlantic Company in 1856. He worked hard to arouse interest in the enterprise on both sides of the Atlantic, and the first cable was laid in 1858. This, however, was soon broken, and then the

Civil War eaused a temporary cessation of operations. But in 1866 final suceess attended his efforts, and he reeeived a gold medal and the thanks of the nation. He also interested himself greatly in the New York elevated railway.

Field, David Dudley, an Ameriean jurist, brother of the above, was born in 1805, in Connecticut. He was the first President of the Association for the Reform of the Law of Nations, and for the substitution of the prineiple of arbitration in plaee of war. He praetised long at the New York bar, and did mueh towards reforming the judicial system. In 1857 he produeed a political and eivil eode, which was either partially or entirely adopted by several states. He was instrumental in the formation of the Committee of the British Soeial Science Congress for the eonsideration of an International Code, whieh eommittee presented its report in 1873.

Fieldfare (*Turdus pilaris*), or Grey Thrush, a native of Northern Europe, visiting Britain and the southern parts of the Continent and western Asia in winter. It is about 10 inehes long, general upper surfaee deep ehestnut, with the head and neek bluish-grey; the breast is reddish-yellow, streaked and spotted with black, the rest of the undersurface white. The fieldfare feeds on molluscs and worms, and, failing these, on haws and other berries and seeds. The eggs are five or six in number, light-blue mottled with brown or black, but these birds rarely breed in Britain.

Field Glass is a special form of telescope adapted for such purposes as the observation of raees or the inspeetion of distant views. It elosely resembles the ordinary opera-glass, but the latter is designed for shorter distanees. The field-glass is usually binocular, eonsisting of two Galilean telescopes (q.v.) arranged side by side. Such glasses give ereet images, whereas ordinary teleseopes give inverted images. A serew-nut placed between the two tubes enables the observer to adjust the distanee between objeet-glass and eyepiece so as to suit his partieular sight.

Field Magnet, in *Magnetism*, is a special magnet plaeed suitably in a given mechanism so that its field of foree may be utilised to control the motions of other magnets, to generate motion in armatures through which eleetric eurrents are passed, or to generate eleetrie currents through armatures that are set in motion in the given field of force. The first funetion is performed in several eleetrical measuring instruments, the seeond in electrie motors, and the third in dynamos. The design of a field-magnet depends on the qualities required of its field of force. For this field to be very intense—*i.e.* for the aetion on a small magnetic pole to be very great at any part of the field—the magnet should be built of soft iron, and should be exeited by being eovered with coils of wire round which a powerful electrie current is flowing. The two ends or poles should be brought as near as possible together, the field of foree being then confined praetieally to the spaee between the pole-pieces. Special shaping of these pieces will render the field locally intense, or will produee general uniformity in its intensity. [Galvanometer, Magnetism.]

Field Marshal, the highest rank of officer in the British, German, and other armies. The first English field-marshals were John, Duke of Argyle, and George, Earl of Orkney, who reeeived the title in 1736. It was abolished in Franee in 1848, and has never existed in the United States.

Field Mouse, a popular name for *Mus sylvaticus* [Mouse], but loosely applied also to *Arvicola agrestis* and *Sorex vulgaris*. [Shrew, Vole.]

Field Officer, an officer above the rank of captain, but below that of general. The three grades of field-offieers—eolonels, lieutenant-eolonels, and majors—are all mounted, and, in the infantry, eommand regiments, battalions, and semi-battalions respeetively.

Fielding, Antony Vandyke Copley (1787–1855), a noted English painter in water-eolours. He began to exhibit in 1810 at the Soeiety of Water Colours, and at the Royal Aeademy in 1811; but most of his works were sent to the water-eolour exhibitions, and he beeame successively a member, secretary, treasurer, and (from 1831) president of the Royal Soeiety of Water Colour Painters. For some time he lived in Sussex, and some of his most successful pietures were views taken in the South Downs. He also painted well storms at sea and British lake and mountain seenery, and also painted a few pictures in oil.

Fielding, Henry (1707–1754), a distinguished English novelist, was born at Sharpham Park, in Somerset, his father being a general and his mother the daughter of a judge. He was conneeted with the Fieldings, Earls of Denbigh, and was thus a eousin of Lady Mary Wortley Montagu. He was edueated first by a eurate in his own neighbourhood, who is said to have sat for the portrait of Parson Trulliber, and then went to Eton. About this time some love troubles seem to have befallen him, and we next find him studying law at Leyden. He seems also at this period to have been in straitened eireumstanees, for although he had an allowanee from his father it was seldom paid, and the son's habits were eareless and extravagant. Upon his return to London he devoted himself to play-writing, and his *Love in Several Masques* was produeed in 1728, to be followed by the *Temple Beau* in 1730, to be followed later by the *Modern Husband*, a play of a type that did not find favour with the play-going publie. From Molière he adapted the *Mock Doctor* and the *Miser*. He made, however, a great suecess with burlesques, of whieh *Tom Thumb* (1730) and *Don Quixote in England* were well received. About this time he married a lady who is commonly thought to be the model from whieh he drew his Sophia Western. Shortly afterwards, some of his satire displeased Sir Robert Walpole, who introduced a bill into Parliament providing that all plays should be licensed by the Lord Chamberlain. This put an end to Fielding's theatrical career, and he turned his attention to

law, entering at the Middle Temple in 1737, and being called to the bar in 1740, when he joined the Western Circuit. In this year Richardson's *Pamela* appeared, and Fielding, in ridicule of its sentimentality, published, in 1742, his *Joseph Andrews*, where the *rôles* of the principal characters are reversed. This has lately been dramatised by Mr. Buchanan as *Joseph's Sweetheart*. About this period of his life Fielding had many difficulties, and was well befriended by Lyttelton, the Duke of Bedford, a Mr. Allen, who is thought to be the original of Parson Adams or Squire Allworthy, and others. In 1747 he made a second marriage, and in the following year was appointed Justice of the Peace for Westminster, holding his sittings at Bow Street. This position, though not of as much importance as at the present day, gave him considerable influence, and he appears to have discharged its duties with zeal and integrity, and to have made efforts in the direction of legal reform. He was, later, appointed chairman of quarter-sessions. His masterpiece, *Tom Jones*, was published in 1749, and has been translated into many languages, and dramatised both abroad and at home, where Mr. Buchanan produced it under the title of *Sophia*. Coleridge speaks of its fresh, breezy nature. In 1751 appeared *Amelia*, a character for which he has been supposed to have drawn upon his second wife, and the book was read with pleasure by Johnson, who did not, however, abstain from calling its author "blockhead" and "barren rascal." In all, Fielding wrote twenty-four plays, and many pamphlets, etc., while he both contributed to and conducted newspapers at different times of his life. In later years his ill-health compelled him to take a voyage to Lisbon, where he died; and in the journal of this voyage Walpole is spoken of in terms which show that the ancient grudge between them had disappeared. *Tom Jones* and *Joseph Andrews* have long been considered as classics, although their style does not suit them to general reading according to the tastes of the present day.

Fieri Facias, a judicial writ of execution issued on a judgment obtained in an action in the Courts of Justice. It is directed to the sheriff of the county in which the goods and chattels of the person against whom the judgment is given are situate, and is called a Writ of "Fieri Facias," from the words in it whereby the sheriff is commanded "*quod fieri facias de bonis*," etc. (that he cause to be made of the goods and chattels of such person the debt or sum required). From this writ neither peers nor any other privileged persons are exempt, and it lies also against executors and administrators with regard to the goods of their deceased. The sheriff may not break open any outer door to execute the writ, but must enter peaceably; and he may then break open any inner door in order to take the goods. He cannot execute the writ on a Sunday, or within the precincts of a royal residence. But he may sell the goods and chattels of the party against whom the writ is issued, including even his estate for years (which is a chattel real) or his growing crops (which are in the nature of personalty), till he has raised enough to satisfy the judgment. This, however, is subject to certain restrictions, which the law has deemed it reasonable to impose for the protection of landlords; for, first by 8 Anne, c. 18, the sheriff cannot lawfully sell goods lying upon any premises demised to a tenant, unless the landlord be first paid his rent accrued due before the execution, to the extent of one year's arrears (in case of a weekly tenancy only four weeks' arrears), and, secondly, by 56 George III., c. 50, no sheriff shall carry off, or sell for the purpose of being carried off the premises, any straw, hay, manure, or the like from any lands let to farm in any case where by the covenants or agreements in the lease the carrying off the same is prohibited as between landlord and tenant, but such produce may nevertheless be lawfully sold to any person who will agree in writing to use and expend the same upon the lands according to the tenants' obligation, and lastly by 14 and 15 Victoria, c. 25, sec. 2, if growing crops are seized and sold on a fieri facias or other writ of execution by the sheriff, they shall still, so long as they remain on the lands (and where there is no other sufficient distress), be liable to be distrained for rent becoming due from the tenant after such seizure and sale. By the Common Law no personal chattel could be taken under this writ that was not in its nature properly capable both of manual seizure and sale, but by 1 and 2 Victoria, c. 110, sec. 12, the sheriff may now upon a fieri facias take any money, bank-notes, bills of exchange, or other securities for money belonging to the party against whom the writ is sued out, and may also sue upon such bills or securities in his own name, paying over the money to be recovered thereon to the creditor. If the sheriff is unable to sell the goods at a reasonable price, he may make his return upon the writ, that they remain in his hands for want of buyers, upon which the party suing out the execution may proceed to take out a writ of *venditioni exponas*, and under this latter writ, called a Writ *assistant*, the sheriff is bound to sell them for the best price, however inadequate. [EXECUTION.]

Fieschi, GIOVANNI LUIGI DE, Count of Lavagni (1523–1547), belonged to a noble Genoese family, which had numbered two Popes in its ranks. He adopted the French and democratic views in the politics of his country, and hated the Dorias, who represented the aristocratic party. He formed a conspiracy with his brothers and friends for introducing the French supremacy, and, with a view to obtaining possession of the persons of the Dorias, he invited them to a banquet, which, however, they refused to attend. He then seized the arsenal, and in the endeavour to board some galleys in the port he was drowned, and, though the conspiracy succeeded for the moment, the power of the Dorias remained unshaken. Fieschi's life has supplied a motive to both poets and prose-writers, the most notable of the latter being Mascardi, who wrote upon it in 1629.

Fieschi, JOSEPH MARIE (1790–1836), was born in Corsica, and enlisted at eighteen in the army of Murat, King of Naples. He served in Russia, but appears always to have been a black sheep, and in

1816 was condemned to ten years' imprisonment for forgery. In 1830 he managed to obtain by fraud a government appointment in Paris, but was dismissed. In 1834 he fired a kind of gun with twenty-four barrels from a house as the king, Louis Philippe, and his retinue passed. The king was grazed, and eighteen people were killed, and Fieschi himself wounded. He was tried and executed.

Fiesole (the ancient *Fæsulæ*) is an Italian town situated on the top of a hill above the Arno, 3 miles W. of Florence. It is a small town of no importance except for its historic associations. There are remains of Etruscan fortifications, and of a Roman theatre. The cathedral of 1028 is a basilica, with a remarkable crypt. Sulla settled his veterans here, and here Catiline, the conspirator, took his stand. The town was the native place of the painter known as Fra Angelico, and for a time the home of W. S. Landor.

Fife, a small kind of flute, with a compass two octaves from D on the fourth line of the treble clef. Fifers were employed at an early date in the British army; they were discontinued in the reign of James I., but revived in 1747, and now form part of all cavalry and infantry regiments.

Fife, or **Fifeshire,** is a coast county of Scotland, lying between the Firths of Forth and Tay, and is 43 miles long, with a breadth varying from 17 to 6 miles. It is bounded on the N. by the Tay and the counties of Perth and Kinross, on the S. by the Forth, on the E. by the German Ocean, and on the W. by Clackmannan and a part of Perth, and contains 316,089 acres. The surface varies, having the Lomond Hills (1,720 feet), Largo Law (1,020 feet), and Norman Law (850 feet), with mosses, moors, and rocky hills in the W.; while the Howe of Fife is a beautiful valley, fertile and well cultivated, 10 miles long and from 2 to 3 broad, on each side of the Eden. Another river is the Leven, and they both have good salmon-fishing. While the shore of the Firth of Tay is cold and barren, that of the Firth of Forth is very fertile, and produces splendid crops. Cattle and sheep-rearing is much carried on, and the coast fisheries are extensive. Coal, iron, limestone, and freestone are worked, and there are many blast-furnaces. The county is renowned for its linen manufacture, of which, among the many towns of the county, Dunfermline and Kirkcaldy are the chief seats. The capital is Cupar, and the University of St. Andrews is the oldest in Scotland. There are two parliamentary divisions, each of which returns one member.

Fifth Monarchy, the millennium or personal reign of Christ on earth, which was looked for in the time of Cromwell by the sect called "Fifth Monarchy Men." The four preceding "monarchies" were those of Assyria, Persia, Greece, and Rome, enumerated in the Book of Daniel. These enthusiasts would acknowledge no human ruler, and organised risings in 1657 and 1661, which were, however, unsuccessful,

Fig (*Ficus Carica*, said to derive its name from the Hebrew *Feg* and the district of Caria) is a deciduous tree, not exceeding 20 or 30 feet in height, belonging to the mulberry family. It has an acrid milky juice, rich in caoutchouc, and containing a peptic ferment, so that meat wrapped in its leaves is rendered tender. Its leaves are scattered, three to five-lobed, and rough, and its minute flowers are monœcious and form a hollow capitulum, top-shaped or pear-shaped, and almost closed above. This is axillary and bears male flowers chiefly near the upper end of the cavity. The common receptacle ripens like a true fruit, its chlorophyll changing colour and much sugar being formed, whilst the numerous small round fruits or "seeds," each really containing a seed, become imbedded in the pulpy interior. These changes seem independent of fertilisation; but if not fertilised the figs are said to drop off, and from early times in the Ægean it has been the custom to place boughs of the wild fig or *caprifig* over the cultivated trees in order that certain hymenopterous insects of the genera *Blastophaga* and *Sycophaga* may crawl into the receptacles of the cultivated plants. It is disputed whether or not this process of *caprification*, as it is termed, has any efficacy, and whether the insects carry the pollen and so secure fertilisation or hasten maturation by puncturing the receptacle. The fig seems to be a native of Syria, but spread in prehistoric times into Persia, Greece, Northern Africa, and France. It is frequently mentioned in the Bible. Attic figs became so celebrated that laws were passed prohibiting their exportation, to which we owe the word "sycophant," for a base informer. Romulus and Remus were said to have been suckled under a fig-tree; Bacchus was crowned with its leaves; and Cato stirred up the Romans to undertake the third Punic War by exhibiting a fresh fig from Carthage, their too-near rival city. Introduced into England, probably in 1548, by Cardinal Pole (trees planted by him are still living at Lambeth), the fig is cultivated near Worthing and elsewhere in the south of England, but suffers much from frost. Some 160,000 cwt. of the dried fruits, valued at £250,000, are imported annually, chiefly from Smyrna and Portugal. They are dried in the sun, the best kind, known as Elemi, being "pulled" out flat during the process. Containing 57·5 per cent. of glucose or grape-sugar, which forms a white powder on the surface, and 6 per cent. of albumen, figs form a principal article of food in the Levant. Medicinally figs act as a gentle laxative and enter into the confection of senna, whilst from the time of Hezekiah one of the "fruits" cut open has formed a popular cataplasm for boils and sores. The spongy wood of the tree is in France saturated with oil and emery and used as a hone.

Figaro, a character in Beaumarchais' *Barbier de Seville* and *Mariage de Figaro*, represented at Paris in 1785. Figaro is a cunning knave, who knows how to take advantage of circumstances. The Parisian newspaper of that name was founded in 1854.

Fighting Fish, the translation of the Siamese name of *Betta pugnax*, a small fish of the Acanthopterygian family Labyrinthici. An artificial

variety of it is reared for fighting in Siam, where encounters between these fish are a favourite amusement. When the fish is quiet it is dull-coloured, but if it sees an antagonist or its own image in a looking-glass, "the whole body shines with metallic colours of dazzling brilliancy, while the projected gill-membrane, waving like a black frill round the throat, adds something of grotesqueness to its appearance." In this state it makes repeated darts at its real or reflected antagonist.

Figueras, a frontier town of Spain, is in the province of Gerona, 20 miles W. of the town of that name, and is situated on a cultivated plain which produces olives and rice. The manufacture of leather and paper is carried on, and there is some trade with France. There is a strong and well-entrenched fortification, and the citadel accommodates a large garrison. The town was several times taken and retaken during the Peninsular War.

Figuier, Louis, a French writer and man of science, born (1819) at Montpelier, where he became professor of pharmacy in 1846. He was afterwards appointed to a similar post at Paris. He has written upon alchemy, the immortality of the soul, modern science, etc., and several of his works have been translated into English.

Figurate Numbers are special series of numbers of interest in the Calculus of Differences. *Triangular* figurates are based on the series of natural numbers 1, 2, 3, 4, 5, ... , and may be calculated by a set of successive additions. Thus the fourth number of the series is the sum of the numbers 1, 2, 3 and 4; the fifth is the sum of the first five, and so on. Thus starting with

1 2 3 4 5 6 7 etc.,

the first order of triangular figurates is

1 3 6 10 15 21 28 etc.,

the second order is

1 4 10 20 35 56 84 etc.,

the latter series being obtained from the preceding in precisely the same way. *Square* figurates start with the series

1 3 5 7 9 11 etc.,

the difference being 2 between consecutive numbers. *Pentagonal* figurates have as basis the series whose common difference is 3, and so on for higher series.

Figure, in *Geometry*, means any combination of points, lines, areas, or solids. It need not necessarily be continuous from one part to another.

Figure-head, an ornamental figure at the head of a ship, immediately below the bowsprit. It usually represents the object, person, or idea which gives its name to the vessel.

Fiji, a group of islands in the South Pacific Ocean, which have lately come into prominence on account of their having been ceded to England. They lie between lat. 15° 30′ to 19° 30′ S., and long. 177° to 178° W. Of the 260 islands only 80 are inhabited, and the whole group is divided into two groups, the Eastern and the Western. The two largest of the islands are Viti Levu and Vanua Levu, and there are about a dozen other important islands. The islands are volcanic in origin, and there are basaltic peaks some thousands of feet in height. Rich foliage covers the islands, which are surrounded by coral reefs, and have shores sometimes precipitous, sometimes covered with fine coral sand. The soil is fertile, and produces abundantly cocoa-nut palm,

Typo. Etching Co. Sc.

FIJI ISLANDS.

bread-fruit, and banana. Among cultivated productions are the orange, yam, maize, tobacco, and sugar-cane. There are some good timber trees. The pig is much used for food, and fish and birds are plentiful. One great industry is the preparation of copra. The people often live in palisaded towns, each of which has one, if not more, spirit-house for the worship of a deity. The chief towns are Sava, Vanua, and Levuka, which has a good harbour. It was in 1874 that England, after repeated offers from 1859 downwards, accepted the government of the islands.

Fijians (*Kai-Fiji*, *Kai-Viti*), the inhabitants of the Fiji Archipelago, South Pacific Ocean, who occupy a somewhat intermediate position between the black populations (Melanesians) of the western groups (Solomons, New Hebrides, New Caledonia, etc.), and the large brown Polynesians of the eastern groups (Samoa, Tonga, Tahiti, Hawaii, etc.). The Aborigines appear to have been distinctly Melanesians, who have been variously modified by contact with Polynesian intruders, especially from Tonga; hence they now exhibit every shade of transition between the two types, black colour and frizzly hair predominating in the western, brown and lank hair in the eastern members of the group. In general they are a large, muscular race, and although formerly pronounced cannibals, display more intelligence, physical and mental energy than any other group of South Sea Islanders. The language, which belongs to the Melanesian branch of the Malayo-Polynesian family, is spoken in as many as fifteen distinct dialects, of which four have been reduced to writing by the missionaries;

the literary standard is the Mbau of the Rewa delta, south-east coast of Viti Levu, and into this the Bible has been translated. Viti and Fiji are the same word, the Melanesian *f* of the western group being replaced in the eastern group by *r* introduced from Tonga. Before the British annexation (1874) the Mbau were the ruling people, and it was their king, Thako-mbau, who ceded the archipelago to England. There were forty distinct tribes altogether, of whom the most powerful, next to the Mbau, were the Mbena, Mba, Narua Nadroga, Vudd, Rakeraki, Vura, Mbua, Mucuata, Cucadrove, and Lakemba; total population (1891), 121,000, of whom 106,000 are Fijians proper. (Waterhouse, *Fiji, its King and People;* Miss Gordon Cumming, *At Home in Fiji*, 1882; De Ricci, *Fiji;* Calvert and Williams, *Fiji and the Fijians.*)

Filaria, a minute nematoid worm belonging to the genus Filaria, has been found in the blood of human beings affected with the disease called chyluria. It has been named by its discoverer, Dr. Lewis, of Calcutta, the *Filaria sanguinis hominis.* The parasite appears to affect only the inhabitants of tropical and subtropical countries. Many of the lower animals harbour parasites belonging to the genus Filaria. [GUINEA-WORM.]

Filbert, a barbarous corruption of the French *feuille*, a leaf, and the English word *beard*, applied to those varieties of the cultivated hazel (q.v.) in which the leafy husk, or cupule, projects beyond, and is so contracted as to entirely enclose the nut. There are three chief varieties: the "white," the "red," and the "frizzled," named from differences in the testa or "skin" of the kernel. Some 600 tons are grown annually, especially round Maidstone, in Kent. When quite ripe they will keep for several years if in a dry place.

Fildes, LUKE, R.A., an English figure-painter, was born (1844) in Lancashire. He studied at South Kensington and at the Royal Academy, and his designs for woodcuts often appeared in *Once a Week*, the *Cornhill Magazine*, and the *Graphic*, and he illustrated Dickens's fragment of *Edwin Drood*. In 1868 he exhibited *Nightfall* at the Royal Academy, and later his *Applicants for Admission to the Casual Ward* and the *Widower*. He has since devoted himself much to portraits and figures of Venetian life. He exhibited five portraits in the Academy, 1892.

File Fish, any individual of the genus Balistes, of the family Sclerodermi, with about thirty species, from tropical and subtropical seas. There are strong teeth in both jaws, by which these fish break off the coral, or crush the shells of the molluscs, on which they feed. The first of the three dorsal spines is rough in front, whence the popular name. They are also called Trigger-fish, from the fact that the second dorsal spine must be pushed down before the first can be depressed, the second spine being compared to a trigger. Two species, *B. maculatus* and *B. capriscus*, sometimes occur on the British coast. All are unfit for food.

Files are special cutting tools worked by hand. They present flat or rounded surfaces of steel, uniformly covered with small teeth. These have been produced by repeatedly striking the steel with a special chisel so as to raise regular burrs of sharp metal. File-cutting by machinery is attended by many difficulties that have not yet been completely overcome. The temper of the file must be accurately adjusted; if too hard the teeth are brittle, and tear off; if too soft the teeth flatten down, and the file is quickly rendered useless. Files are classified according to their shape, size, and cut. The ordinary shapes are too familiar to need description. *Single-cut* files have their teeth cut in rows of one direction only; *double-cut* files have in addition another series of parallel rows intersecting the first series, and made of somewhat smaller teeth. The fineness of cut ranges from 20 to 250 teeth to the inch. The teeth are sharpened by the process of sand-blasting (q.v.)

Filibusters, a kind of buccaneers, who did much injury to Spanish commerce in the West Indian seas. The term is probably derived through French and Spanish, from a Dutch word akin to the English "freebooter." The modern filibusters are adventurers who seek to upset the government of a foreign state—as, for example, the American William Walker, who made himself ruler in Nicaragua in 1855–58.

Filicaia, VINCENZO DA (1642–1707), an Italian poet, was born at Florence. He composed poems in Latin and in Italian, and some odes that he wrote upon the defeat of the Turks by John Sobieski and the Duke of Lorraine were printed in 1684. The Queen of Sweden, Christina, and the Grand Duke of Tuscany both befriended the poet, and he was eventually made governor of Pisa. His works were collected by his son Scipio, and published as *Poesie Toscane di Vincenzo da Filicaia.*

Filicineæ, the name of one of the main divisions of the Pteridophyta. It is characterised by its relatively large and well-developed leaves; and by the sporangia being borne on the under surface or on the margin either of ordinary leaves, or of some specially modified but not confined to one region of the stem. In most of them the spores are all of one kind (*isosporous*); but the Rhizocarpæ or Hydropteridæ, including the Salviniaceæ and Marsiliaceæ, are *heterosporous—i.e.* have male microspores and female megaspores. In most of them also the sporangia originate from single epidermal cells, like trichomes (q.v.), or are *leptosporangiate;* but in the Ophioglossaceæ and Marattiaceæ they are *eusporangiate*, or originate from a group of cells, like a leaf-structure. One of the most recent classifications presents them as follows:—

SERIES A.—ISOSPORIA OR HOMOPORIA. SERIES B.—HETEROSPORIA.
Sub-series 1.—Leptosporangiata.
Class.—Filices (true ferns).
Sub-series 2.—Eusporangiata.
Order.—Marattiaceæ.
Order.—Ophioglossaceæ.
Class.—Rhizocarpæ.

Filigree consists of fine gold or silver wire worked up by plaiting and soldering into a kind of network, of which crosses, earrings, and other

ornaments are made. Another kind of filigree-work is made by soldering wires or metal plates on to articles with a solid basis, so as to form an ornamental pattern on the surface. The art was carried to a high pitch of excellence by the ancient Greeks and Etruscans. It was also cultivated in the Middle Ages, especially among the Scandinavians and Irish Celts; and it still exists in India and Central Asia, as it did at a remote period of antiquity. The chief seats of the modern industry are Malta and the towns of North Italy.

Fillan, ST., the name of two saints. (1) Also called Faolan, the leper, had a church at Loch Erne, in Perthshire, and a healing well. There is also a seat known as St. Fillan's chair, and he had also a church in Queen's county, Ireland. (2) An 8th century abbot, son of St. Kentigern of Inchcaileoch, in Loch Lomond. He, too, had a church in Strathfillan, Perthshire, and a linn in the Dochart glen which worked cures. His quigrich, or crosier-head, was entrusted by Robert Bruce to a family who still possess it.

Fillmore, MILLARD (1800–1874), a President of the United States of America. After spending his early years in wool-carding, carefully educating himself in the intervals of labour, he turned his attention in 1819 to law, and in 1823 was called to the bar of New York. In 1828 he became a member of the State Legislature, and in 1848 was Vice-President of the Union. In 1805–53 he was President, and became unpopular in the North through his advocacy of the fugitive-slave law. When the Civil War broke out he took no active part, but used his influence upon the side of the Union.

Filmer, SIR ROBERT, who died 1653, was a Royalist of the Stuart period. He was educated at Trinity College, Cambridge, and was knighted by Charles I. He wrote a work called *Patriarcha.* in which he advocated the extreme doctrine of Divine right, considering the country to be the king's family, and the patriarchal family with all its *patria potestas* to be the model of political rule. The book has no great pretensions either in style or argument. Sir Robert had the courage of his opinions, and is said to have been plundered ten times, and to have been imprisoned in Leeds Castle for his loyalty to the losing cause. The family still retains the old seat and estate at East Sutton, in Kent.

Films. In photography, films, usually of sensitised gelatine, are frequently used in place of the ordinary coated-glass plates, for the production of negatives. Many different varieties of films are in use; paper is very frequently used as a support for the gelatine, either rendered transparent by vaseline, etc., or capable of being stripped off from the film after development as in the Eastman stripping film. They possess the advantages over glass of (1) being less liable to cause "halation," (2) possessing less weight, and (3) admitting of use in lengths or rollers. They are hence very popular amongst touring photographers, with whom portability is a great consideration.

Filter is an instrument for the purification of water or other fluid. When water containing suspended particles of solid matter is passed through porous material such as powdered charcoal or unglazed earthenware, the passage of the solid matter is arrested and the liquid passes through in a state of greater purity. It is found also that a portion of those ingredients that are held in solution, and that therefore present no solid obstruction, is retained by the filtering medium. And further, organic impurity in the water may be oxidised and so destroyed by passage through a medium like charcoal, which possesses to a remarkable degree the power of absorbing air and of oxidising matter brought in contact therewith. On such principles are modern filters constructed, the chief practical difficulty being that of clogging; the pores of the filter are apt to become closed up by the impurities arrested, and the instrument ceases to act with sufficient rapidity. For the purification by filtering of large quantities of water such as are passed along the mains of a water company, *filter-beds* or reservoirs of special construction are used. The impure water as gathered in from the river or other source passes into a large basin and heavy sediment is allowed to settle down; the water is then passed into another basin the bottom of which is covered with successive layers of large stones, pebbles, gravel, and fine sand. In passing through these layers the water is well purified of suspended matter. Nearly the whole of the filtration occurs in an extremely thin layer at the top of the filter-bed, which rapidly becomes clogged with sediment and vegetable matter. At intervals of from one to three months a layer of about half an inch thickness of the fine sand is scraped away, this process being repeated till it becomes necessary to spread a fresh layer of sand over the filter-bed. The dirty sand is oxidised by exposure to the air, and after being well washed it may be again used. Filters such as are required for household purposes do not vary much in design. An efficient filter may be cheaply made with an ordinary flower-pot. The hole is blocked up with a piece of sponge, a layer of pebbles is placed at the bottom, and this is covered with a layer of fine gravel. Over this is spread powdered charcoal to a depth of four inches, and this is protected by being covered with another layer of small pebbles. The charcoal requires occasional renewal, but the periods of such renewal are much farther apart if the water passes into the filter from another pot, the hole of which is plugged with sponge. Filters of ordinary manufacture are much the same in principle as the above. The charcoal is sometimes compressed into a solid, porous mass, but to no great advantage. The means adopted to prevent clogging are generally such as force the water to flow upwards through the filter, leaving the sediment at the lowest layers to fall back into the water below. Air is to a great extent purified of deleterious gaseous animal and vegetable products by being passed through a sieve filled with small fragments of charcoal. A sieve of fine muslin is found effective in purifying air of suspended solid particles of soot, etc., but it rapidly becomes filthy if used continuously in any large town.

Filter Pump, an instrument in extensive use in chemical processes of filtration. Ordinary solid substances suspended in liquid are generally separated out by the chemist by filtering through specially-prepared blotting-paper. A circular disc of the paper is folded and wrapped round the inside of a glass funnel so as to fit closely against its sides. The liquid being then poured into the funnel, passes slowly through the paper and down the tube, leaving the solid matter behind. If the process is slow on account of viscosity of the liquid or the clogging nature of the solid, the process is hastened by the filter pump, which is an arrangement for producing a partial vacuum at the lower end of the funnel and so for sucking the liquid down through the filter. It is then necessary to strengthen the lower parts of the filter-paper by using a little cone of platinum foil at the apex of the funnel. In rougher operations with the filter pump the filter paper is entirely dispensed with, a small sieve of china taking its place.

Finch, any bird of the not very strictly defined family Fringillidæ, which is nearly universal in its distribution, and characterised by a stout conical beak, and toes adapted for climbing, the hinder toe usually the longest. They feed principally upon seeds. Most of them are monogamous, and they usually build elaborate nests. The principal members of the family are dealt with under their popular names.

Finch, Heneage (1621–1682), was born in Kent, and educated at Westminster and Christ Church. He was called to the bar in 1645, and after the Restoration was appointed Solicitor-General, in which office he took part in the trial of the regicides. In 1670 he became Attorney-General, and in 1675 Lord Chancellor, and was made Earl of Nottingham. He seems to have been a good orator, and a sound and upright lawyer.

Finder is a small telescope ranged parallel to every large one for the purpose of locating that portion of the field of view which it is desired to examine. The larger instrument takes in a smaller area, and therefore would require much moving about to locate an object. But by pointing the finder at this object, the telescope must also be directed towards it, for the two are kept parallel to each other. As the finder and the telescope are concentric, when the object viewed is at the centre of the finder (marked by intersecting lines), it must be within the field of view of the telescope.

Findlater, Andrew (1810–1877), a man of letters, was born in Aberdeen, and educated at the university there. He at first studied theology, and then became a schoolmaster. From 1842–49 he was head-master of Gordon's Hospital, Aberdeen. He then spent some time in Canada, and in 1853 took work in the house of Messrs. Chambers. Besides other work, he edited the Encyclopædia, contributing many of the articles himself, a matter for which his all-round knowledge eminently fitted him. He also collaborated in preparing for the press James Mill's *Analysis of the Phenomena of the Human Mind* (1869).

Fine. A species of assurance of real property which was commonly in use for conveying estates of freehold, prior to, but which was abolished by, the "Act for the abolition of fines and recoveries and for the substitution of more simple modes of assurance," passed in 1833. It was an amicable arrangement (*finis concordiæ*) of a suit either real or fictitious, but usually the latter, between the demandant and tenant, with the consent of the judges, and enrolled among the records of the Court. Its modern substitute and equivalent is a disentailing deed, executed by the tenant in tail and enrolled, but in which the protector of the settlement has refused to concur. If a married woman levied a fine, she forfeited all her rights in the land, but the necessity of obtaining the consent of the judges afforded a sufficient protection of the rights of the lady. Its modern substitute is a deed acknowledged before a judge or duly authorised commissioner. [Estate.]

Fingal, the chief hero in the poems of Ossian (q.v.). The real Fingal was a King of the Leinster Fenians; but the Fingal of Macpherson's work is made to be king of an imaginary Morven, which may have been intended for a part of Argyle.

Fingal's Cave, a most remarkable cavern, named after the hero of the poems of Ossian, on the east side of the small island of Staffa, one of the Inner Hebrides. It has been hollowed by the action of the sea out of a sheet of Tertiary basalt with vertical columns. The entrance is an irregular arch 53 ft. broad and 117 ft. high. The interior is 250 ft. long.

Fingo (*Fingu, Ama-Fingo*), the collective name of a number of broken Kafir tribes, dispersed at the beginning of the present century by Chaka, founder of the Zulu military power in south-east Africa. In response to their appeal for protection from their Zulu-Kafir persecutors many were removed by the English Government in 1835 to the district now known as Fingoland between the Kei and Bashi rivers east and west. Here most of them have been converted by the Protestant missionaries; they are industrious agriculturists and stock-breeders, doing a considerable export trade in farm produce with Cape Colony. All the children attend the missionary schools regularly, and many display some talent for literature and music. The Ama-Fingo, that is, "Mendicants," "Suppliants" (from *fenguza* = to seek service) are increasing in numbers, having advanced from 74,000 in 1875 to over 90,000 in 1891.

Finial, an ornament in Gothic architecture, placed on some lofty or conspicuous part of a building, such as the apex of a gable or summit of a pinnacle. It generally has the form of a knob, which is carved in imitation of foliage. It was introduced in the 12th century, and was much used in the Decorated style; the finials of that period exhibit great variety and skill in their workmanship. It survived the decay of Gothic architecture, but entirely lost its beauty of form; in Elizabethan buildings it was usually made on a

geometrical pattern, while at a later period the place of the finial was taken by a ball or obelisk.

Finistère, a French department at the west extremity of France, bounded on all sides, except in the E., by the sea, and having an area of 2,595 square miles. Tall granite cliffs deeply indented by the waves form the coast, and on the west are the roadstead of Brest and the Bay of Douarnenez. Two chains of hills, those of Arré in the N. and the Montagnes Noires farther south, both sending out many spurs, render the department very hilly. The navigable rivers are the Aulne, Elorn, and Odet, and there are many smaller streams, and a canal between Brest and Nantes. About a half of the surface is cultivated, and produces good wheat, rye, and oats, with potatoes and flax, and a good deal of cider is made. There are good sardine and other fisheries on the coast. Among the minerals are iron, zinc, and bismuth, and the lead mines of the department are the richest in France. There is a good deal of ship-building, and there are manufactures of sail-cloth, linen, paper, tobacco, and leather.

Finland, a Grand Duchy subject to the Russian crown, contains 144,200 square miles, and is divided into eight governments. It is generally considered as made up of three parts:—First, the part ceded by Sweden in the 18th century; second, the rest of Swedish Finland, which was ceded in 1809; and third, the part of East Bothnia and Lapland, which was ceded in the same year. The country is bounded N. by Norway, S. by the Gulf of Finland, E. by Russia, and W. by Sweden and the Gulf of Bothnia. The surface is mostly low-lying, and has no hills of any importance, but there are very many lakes, the principal of which are Enara, Ulea, Saima, and part of Ladoga, and there are several rivers, the chief being the Tornea, Kumo, Kymmene, Kemi, and Ijo. Some of the soil is cultivated, and there are large forests, which produce tar, pitch, and resin. Iron and copper are among the minerals, and there are granite quarries which produce huge blocks. There is a good deal of fishing. Helsingfors, the capital, is a fine town, and the country contains some good fortresses, and is well provided with railways and telegraphs. The inhabitants are mostly Finns and Swedes, who are generally Lutherans, and a few Russians and Germans. The Czar is Grand Duke, and the Diet consists of representatives of the nobles, clergy, burgesses, and peasants, and meets every three years. The governing body is composed of twenty Finlanders nominated by the Grand Duke, under the presidency of the Governor-General. The army is composed of Finns, and the law procedure is as in Swedish times. Its political independence has, however, been greatly encroached upon.

Finland, Gulf of, is an arm of the E. side of the Baltic Sea, bounded N. by Finland, S. by the Governments of Esthonia and St. Petersburg. The Gulf is 260 miles long from E. to W., 80 miles wide in the widest part, and 40 miles wide at the entrance. The Neva is the only river of importance flowing into it. There are several islands in it, the strongly-fortified Cronstadt being the largest, and, besides St. Petersburg, it contains the towns of Revel, Fredricksham, Helsingfors, Viborg, and others.

Finlay, George (1799–1875), a historian of Greece from the time of the Roman Conquest downwards. He was born at Faversham, his father being a major of Royal Engineers, and inspector of the Government powder-mills. He was privately educated, and studied law at Göttingen. But now the affairs of Greece absorbed his attention, and in 1823 he went there full of grand ideas as to the freeing and regeneration of the country. In 1826 he took up his abode in Greece almost permanently. In 1829 he bought land in Attica, in order to give his new fellow-countrymen the sight of theory put into practice. This effort had no result except financial loss to himself, so from that time he resolved to serve Greece with his pen. He wrote *Greece under the Romans*, *The Byzantine and Greek Empire, 716–1453*, *Greece under the Ottomans and Venetians*, and the *History of the Greek Revolution*. He also wrote in the *Times*, *Saturday Review*, etc.

Finnish Race. In etymology the term Finn, the *Chude* of the Russians, is applied not only to the indigenous inhabitants of Finland [Finns], but in a much wider sense to a whole group of allied peoples, who form collectively the Finnish branch of the Ural-Altaic (Mongolo-Tatar) family. In this sense they answer approximately to the Scythians of the ancients, and the Russian *Chude* is itself supposed by some writers to be a corrupt form of this word *Scyth*. At the dawn of history a great part of north-east Europe and of north-west Asia was certainly occupied by peoples of Finnish speech, most of whom have since been dispersed, partly by great movements of migration southwards (Magyars to Pannonia, now Hungary; Bulgars to the Lower Danube and others), partly by Mongolo-Tatar encroachments from the east, and Slav (Russian) conquests from the south-west. Nevertheless numerous fragments, and even compact masses of Finnish peoples are still found scattered over North and Central Russia and Siberia, east to the Yenisei basin, as in the subjoined *Statistical Table of the Finnish Peoples.*

	Pop. (1890).
I. Baltic Finns:—	
a. Finns proper of Finland (Suomalaiset) . .	2,000,000
b. Finns of the Baltic and neighbouring provinces: Esthonians (Virolaiset), Livonians (nearly extinct), Vepses of Olonetz and Vologda, Votes of Novgorod . . .	870,000
II. Finns of Lapland (Sabme, Lapps) . .	20,000
III. Volga Finns of Nijni-Novgorod, Kazan, and Simbirsk (Cheremisses and Mordvins) . .	1,200,000
IV. Permian Finns of Perm, Vologda, and Viatka (Permiaks, Ziryanians, Votiaks). . . .	400,000
V. Ugrians of West Siberia (Ostyaks and Voguls).	30,000
VI. Samoyedes of Archangel and North and Central Siberia	20,000
VII. Magyars of Hungary	6,000,000
VIII. Finno-Tatars (Tatarised Finns of the Volga and Ural basins)	1,600,000
Total pure and mixed Finns . . .	12,140,000

Note.—The Bulgarians of the Balkan Peninsula, originally Volga Finns (Volga = Bolga, Bulga), have been completely

assimilated in type and speech to the Slav race, with which they are now classed. (Al. Castrèn: numerous works on the Finnish peoples and languages, all in German, published at Leipzig and St. Petersburg between the years 1841 and 1862. H. H. Howarth, *The Finns and some of their Allies*, Journal of the Anthrop. Institute, 1871; Max Müller, *The Last Results of the Researches respecting the Turanian Family of Languages*, 1855.)

Finno-Tatars. 1. The collective name of all the peoples who form the western division of the Mongolo-Tatar or Ural-Altaic family. Of this division, which extends from the Lena basin, East Siberia, to Lapland, and from the Arctic Ocean to Asia Minor and the Balkan Peninsula, the chief branches are:—(1) *Samoyedes;* (2) *Finns;* (3) *Ugrians;* (4) *Tatars* or *Turks.* For details see under the several entries. 2. In a narrower sense, the expression Finno-Tatars is applied to several groups of eastern Finns in the Volga and Ural basins, who have become more or less assimilated in appearance and language to the surrounding Tatar populations. Such are the *Bashkirs*, numerous in the governments of Orenburg, Perm, Viatka, and Samara; the *Mescheryaks* of Orenburg; the *Chuvashes* of Kazan, Simbirsk, Samara, and Saratov; and the *Tepyaks* of Orenburg; total population 1,600,000.

Finns, properly the indigenous inhabitants of Finland, who are fundamentally of Mongolic stock and speak a Finno-Tatar language, as distinguished from the *Finlanders*, who are Swedish intruders settled on the west and south coasts since the 14th century. *Finn*, though known to Pliny and Tacitus (*Fenni*, *Finnæ*), is not the national name, but is supposed to be of Germanic origin, meaning aptly enough people inhabiting fens, though there are philological objections to this derivation. It has, however, the same sense as the national name *Suomalaiset*, which also means "fen people," from *suoma*, a fen or marsh. Owing to long contact with the surrounding Slav and Teutonic populations, the modern Finns have been largely assimilated in appearance to the ordinary Caucasic (European) type, and are now distinguished by grey or blue eyes, chestnut and in the west even flaxen or towy hair. But the prevalence of high cheek bones, rather broad features, scant beard, and brachycephalic (round) heads betrays their Mongolic descent, apart from their absolutely Mongolo-Tatar speech. They fall into five main ethnical groups, which would appear from their national traditions to date back to remote times:—(1) The *Finns* (*Lapps*) of Lapland [LAPPS]; (2) the *Krains* (Kainulaiset) of Bothnia, with small enclaves in Sweden and Norway; (3) the *Tavastians* of the central and south-western lacustrine districts, who call themselves *Hemeleiset*, or "lake people," from *heme*, "lake." The Tavastians, the "white-eyed Chudes" of their Russian neighbours, are usually taken as typical Finns—broad, squat, stout figures, small and slightly oblique blue eyes, light flaxen hair, fair complexion ("blonde as a Finn," say the Russians), but lacking the transparent rosy colour, the blush of the Anglo-Saxon and North German peoples. Morally also the Tavastians are dull, lethargic, somewhat passive and patient, honest and trustworthy, but suspicious, sullen, and revengeful—altogether true Mongols in temperament; (4) the *Karelians* (*Karialaiset*, probably "herdsmen," from *Kari*, a cow) of Karelia, that is, all south-east Finland stretching into Russia proper as far as Lake Ladoga, and formerly extending to the White Sea ("Karelian Sea") and including nearly the whole of the government of Olonetz.

A TAVASTIAN FINN.

The Karelians differ strikingly from the Tavastians, being much taller and slimmer, with more regular features, straight grey eyes, brown complexion, and chestnut hair hanging in ringlets down the shoulders. They are also more active, cheerful, enterprising, courteous, and intellectual. Kalevala, the hero of the national epic poem, was a typical Karelian; (5) the *Ingrians* (*Ighers*, *Igors*) of Ingermanland, that is, the district at the head of the Gulf of Finland, which was ceded to Russia by the treaty of Nystad (1721). Most of the Ingrians and many of the Karelians have been absorbed in the surrounding Russian populations; but the Tavastians, representing the Conservative side of the Finnish character, have hitherto tenaciously preserved the national sentiment, language, and traditions. Despite the pressure of Sweden on the west and Russia on the east, and although they have enjoyed little political autonomy for the last thousand years (the Swedes had already founded Abo, the historical capital, in the year 1300), the Finns still stand out as a distinct European nationality, and continue to cultivate with success their harmonious and highly poetical language. Since the 12th century they have been Christians, converted to the Catholic faith by "Saint" Eric, King of Sweden, and later to Lutheranism, again by the Swedes. The University of Helsingfors (removed thither from Abo in 1827) is a centre of much scientific and literary activity, and here was issued in 1849 the first complete edition of the

Kalevala, a national epic of some 23,000 verses, that has been compared by some scholars to the *Iliad* and the *Mahâbhârata*. Of sixty periodicals appearing in Finland rather more than half are in Finnish, the rest in Swedish.

Fins, a loose term, including the limbs and locomotive outgrowths of Fishes (q.v.) and Cetacea, the dorsal and caudal crests of some Amphibians, and the swimming organs of some Molluscs, though Woodward notes that the use of the word in this last sense is misleading.

Finsteraarhorn, the highest peak of the Bernese Alps (q.v.), has a height of 14,026 feet.

Fir, a popular name often applied to all the true Conifers (*Abietinæ*) or restricted to the spruces (*Picea*) and silver firs (*Abies*). These two genera agree, and are distinguished from pines and larches by having their narrow, needle-like leaves arranged singly—*i.e.* not in tufts. Their cone-scales also do not become thickened into a woody "apophysis" at their apex. They are conical trees with regular pseudo-whorls of branches, which themselves branch horizontally so as to form a "spray." In *Picea* the ripe cones hang downwards and fall off whole, and the leaves are arranged all round the shoots: in *Abies* the cones are erect and their scales fall off separately, whilst the leaves are in two distinct rows. Of the former genus, the most important is the Norway Spruce (q.v.), *P. excelsa*, other species being the Black and White Spruces (*P. nigra* and *P. alba*) of north-eastern North America. Of the latter, the Silver Fir (*A. pectinata*) is the type, other species being the Balsam Fir of Canada (*A. balsamea*), *A. pinsapo*, *A. pordmanniana* and other ornaments of our parks and gardens. The Silver Fir, a native of Central Europe, has two broad white lines along the under surface of its leaves. The wood is less resinous than spruce, but "Strasburg turpentine" exudes from its bark. From *A. balsamea* Canada balsam is similarly obtained. The Hemlock Spruce (q.v.) (*Tsuga canadensis*) of eastern Canada and the Douglass Spruce or Oregon Pine (*Pseudo-tsuga douglasii*) of the Rocky Mountains, a valuable timber-tree, hardy in the British Isles, belong to allied genera. [Balsams, Pine, Spruce.]

Firdausi, otherwise Abul Kasim Mansur (931–1020), a Persian epic poet, was born at Khorassan. Study of the history of Persia gave him the idea of embodying it in verse, and he went to the court of Mahmoud, who set him about his desired task, and in the course of years he produced a historical poem of 60,000 verses, containing the history of the Persian kings from the beginning down to 632 A.D. The history of Rustam, the Hercules of Persia, is one of the episodes. The Emperor did not keep the promise he had made of a gold piece for each verse, and the poet struck out an eulogy he had made of the Sultan, and made a satire upon him. He then fled into retirement, and Mahmoud repenting sent presents, which arrived in time to meet Firdausi going to his tomb. A good edition of the poem was issued in 1829 by Captain Macan, and parts have been translated into English.

Fire concerns the anthropologist, because its possession is said to mark off man from the lower animals, since, though they appreciate its warmth, even the anthropoid apes are incapable of making fire for themselves, or of keeping it up when it has been made. Wilson (*Prehistoric Man*, i. 136) says that man may be appropriately designated "the fire-using animal." Moreover, man's first acquaintance with fire is the subject of many myths, of which the classic story of Prometheus, a variant of an older Aryan myth, is the best known. Somewhat similar stories are current in Polynesia and in China. The first mention of fire in the Hebrew Scriptures is "the flaming sword which turned every way to keep the way of the tree of life" (Gen. iii. 24). There is nothing about fire in the account of the sacrifices of Cain and Abel, though it is stated (Gen. iv. 4) that "the Lord had respect unto Abel and his offering." But "answering by fire" is of frequent occurrence in the historical books (1 Kings xviii. 24; 1 Chron. xxi. 26; cf. Matt. iii. 11; Acts ii. 3).

We first meet with stories of fireless tribes in Plutarch, and in modern times travellers have again and again brought home accounts of peoples among whom the use of fire was unknown. But after patient sifting, authorities have declined to receive their stories—of course, without any imputation of bad faith, believing them to be based on imperfect observation or untrustworthy reports. It seems, however, to be clearly established that down to the middle of the 19th century the Tasmanians and Australians preferred carrying fire about with them to procuring it by artificial means.

The oldest method of fire-making is that by friction, and of this there were three or four ways. The simplest was that called by Dr. Tylor the *stick and groove*. Two pieces of wood, one hard and the other soft, were taken, and the former was rubbed up and down upon the latter till sparks were produced and tinder ignited. An advance on this was the *fire-drill*, which has a much wider range, and has undergone many modifications. The materials were the same, but a rotary motion was substituted for the rubbing backwards and forwards.

In the primitive fire-drill the stick was twirled between the palms, and in other forms string or a bow was employed. This method was used to procure the *needfire*, probably a survival of some kind of sun-worship, and intended to secure cattle which were driven through it from murrain. To the fire-drill probably succeeded flint and pyrites (the fire stone), and Homer and Virgil mention flint as containing the "seeds of fire." Burning-glasses as means of kindling fire were known in classic times, and it is said that the Vestal Virgins procured fire by these means, though one account states that the priest of Vesta used a fire-drill.

Fire has also a religious importance. In many vanished faiths it was the chief means by which sacrifice was offered to the gods, and was—and, indeed, still is in many places—an object of worship

either independently, or as an emblem of the Sun-god or Supreme Deity. Fire worship seems to have had a wide range among the Aryans, and to have been practised in Mexico and Peru. The Greeks and Romans had special fire-deities; and the cult still lingers in the East, and seems to have left its impress on Christianity itself in the Roman Catholic practice of kindling the new-fire on Holy Saturday.

Fire Box is that portion of the boiler of a steam-engine that contains the fire. For economy of the heat generated therein the fire-box is best surrounded on nearly all sides by water-spaces. In England, and wherever coal is burnt, the fire-box of a locomotive is built of copper plates, for flaws in iron become larger under the action of intense heat, and the heat-conductivity of iron is not so good as that of copper. The box is flat-sided, and therefore liable to be crushed in by the great external steam pressure. It is in consequence strongly braced to the outer shell of the boiler by copper or iron bolts, and the top or *crown* is stiffened by ribs of wrought-iron. The *grate* is a few inches above the *ash-pan*, and is provided with a series of parallel wrought-iron fire-bars. Besides the fire-door through which the fuel is passed, a door opens below to the ash-pan to act as a damper in regulating the air-supply to the furnace.

Fireclay, a special kind of clay capable of resisting the action of fire. It is much used where protection from such action is desirable, and *fire-bricks* of various kinds are employed extensively in furnaces, chimneys, etc., that are composed chiefly of fire-clay. It is found in thin beds in the coal measures, occurring in most places where coal is obtainable. The chief British centres of supply are in the neighbourhood of Stourbridge in Worcestershire, Newcastle-on-Tyne, Gartsherrie near Glasgow, and Poole in Dorsetshire. Stourbridge fire-clay is largely exported.

Firedamp is the ordinary term for the inflammable gas that occurs in coal mines, which is such a source of danger from explosion.

Fire Engine, a machine designed to extinguish conflagrations. It pumps a continuous jet of water upon the fire by means of a force-pump worked by hand or steam. The principle being so simple, the history of the fire-engine extends far back in the past. Hero of Alexandria, writing about 150 B.C., describes a double-action pumping-engine that is but slightly different from the manual of the present day. The sketch shows the general arrangement of a simple manual. A long lever *hh* is worked up and down about an axis through its centre, and gives an alternating motion to the pistons in the pumping cylinders *cc*. Water is supplied to these cylinders through the supply-pipe shown in section at *s*, and, by means of the usual force-pump arrangement of valves, is drawn up through *s* and pumped into the central air-chamber *a*. [PUMP.] This is so called because it contains a quantity of compressed air that prevents the entire filling of the vessel. The delivery pipe passes from this air-chamber, and is supplied with the high-pressure water which the chamber receives. And though the water is pumped into the chamber discontinuously, by reason of the air cushion it emerges therefrom in a continuous stream and at a sufficient pressure to

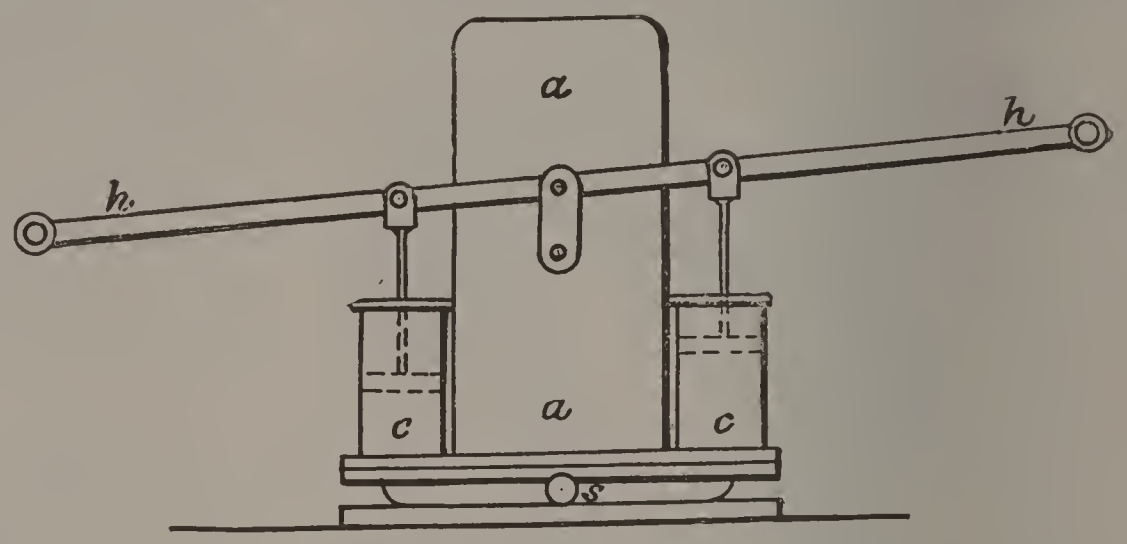


DIAGRAM OF SMALL MANUAL FIRE-ENGINE.
a, Air-chamber; *cc*, pump cylinders; *hh*, pumping levers, with transverse handles; *s*, supply-pipe.

throw itself up to a considerable height. The supply pipe is stiffened with wire, and does not need to be very flexible; the delivery pipe or hose is made of canvas lined with indiarubber. Fire-engines worked by steam are merely steam force-pumps, provided like the above manual with the air-chamber to act as an accumulator. They are more powerful, and when well in action more effective. But their extra weight and mechanism involve more time in getting them to work, and the smaller manuals are often preferable. The latter may be set going almost immediately they arrive, whereas good steam fire-engines require from 5 to 15 minutes to get up steam.

Fire Extinguishers. Various forms of fire extinguishers have at times been devised and patented. Most consist of vessels charged with solutions which upon heating evolve large quantities of gases which do not support combustion, *i.e.* do not allow other substances to burn in them, such as carbonic acid, CO_2, sulphur dioxide, SO_2, etc.

Fire Flies, a group of beetles belonging to the family *Elateridæ* and the genus *Pyrophorus*. Most of the species are American, but some are common in Southern Europe. The pale green light from which they derive their name arises from two small spots on the suture between the thorax and abdomen. [GLOWWORM.]

Firenzuola, AGNOLO (1493–1545), an Italian poet and author, was born at Florence of a family which came originally from Firenzuola, a town in

the Apennines. He studied at Siena and Perugia. He took Pietro Aretino as his guide, philosopher, and friend, and the pupil is said to have done justice to the master's teaching. He practised law for a time, and is said to have died an abbot. He wrote satirical and burlesque poems, and translated into prose the *Golden Ass* of Apuleius; and wrote comedies, and Æsopian fables of animals, and tales after the manner of Boccaccio. His language and style are so good that he is regarded as a classical model.

Fireship, a vessel filled with combustibles and explosives, and sailed, or allowed to drift, alongside an enemy, there to explode. Fireships were successfully employed against the Armada in 1588, in the destruction of French ships under Cape La Hogue in 1692, by Lord Cochrane in Basque Roads in 1809, and on many other occasions; but they were also used by the Rhodians B.C. 190. They are now obsolete.

Firkin, a measure of capacity, the fourth part of a barrel. It contains 9¼ imperial gallons, or 9 gallons of the old ale and beer measure, answering to 8 gallons of the old ale measure in use before 1803, when the same measure was adopted for ale and beer.

Firmament, an ancient name for the vault of heaven. It is derived from the Vulgate or Latin translation of the Bible, in which the word *firmamentum*, denoting something solid and fixed, is used to translate the Hebrew term for the sky and stars. The latter expresses a different idea—that of extending by beating out. In ancient and mediæval times the sky was believed to be a solid revolving sphere of crystal, in which the stars were fixed, sharing its motion round the earth. When the difference in the planets' courses was observed, a new theory grew up, according to which there were several "crystalline spheres," each containing a certain number of fixed stars. The common notion was that there were nine, the nearest being that of the moon and the outermost the *primum mobile*, which set the others in motion. Heaven was somewhere beyond the *primum mobile*. This view of the universe—known as the "Ptolemaic system"—was upheld by the Church long after it had been dispelled by the discoveries of Copernicus and his followers. Any opinion which contradicted it was regarded as heretical, since it appeared incompatible with the statements of Scripture.

Firman, a word of Persian origin, denoting an edict issued by an Eastern potentate or governing body, used especially of the decrees of the Ottoman Porte. In Turkey every firman is signed by the Minister to whose department it relates, but a cipher must be affixed by a special Minister appointed for the purpose before it can become valid. A firman differs from a *hatti-sherif* in that the latter is signed by the sovereign himself, and is irrevocable. Passports and other licences granted by the Sultan are also called firmans.

Firolidæ, the family of Heteropoda (q.v.), including those which are shell-less or have only a small shell. They are all elongated in form and free-swimming in habit. The two best-known genera are *Carinaria* and *Firola*, both of which live in the Mediterranean and the tropical parts of the Atlantic.

Firoz-Khoi, a numerous people of the Murghâb valley, province of Herat, North Afghanistân. They are settled in the territory of the Zeidnat Eimaks [EIMAK], with whom they are grouped by Elphinstone and other authorities; but the Firoz-Khoi are not Eimaks or Hazâras, but true Persians both by descent and speech. They form two main divisions—Mahmudi and Dezai, with 30,000 tents, or total population 150,000 to 160,000. (*Invalide Russe*, 13–25 April, 1879.)

Firozpur, an Indian district of Lahore, forming a commissionership under the Lieutenant-Governor of the Punjab. It occupies an area of 2,740 square miles, between lat. 30° 18′ to 31° 10′ N., and long. 74° 5′ to 75° 29′ E. The surface is generally level, with the exception of a few sand-hills and part of it is watered by the Sutlej. The district is healthy and, for most part of the year, dry, and produces wheat, barley, and other grain. There is a little cotton- and wool-weaving, and the Lahore road is the chief trade-route. The inhabitants are chiefly Mahometan, with some Hindoos.

First-born, a Biblical term for the first offspring of man or beast, which the Lord claimed as a tribute from the Israelites (Exodus xiii. 11–16). It is interesting to note that, long before the law was given, the sacrifice of Isaac (Sarah's eldest son, though not Abraham's) was demanded; and it may be that the law, with its provision for the redemption of male children, involves a reminiscence of the practice of the ancient Semites, who seem to have carried their human sacrifices to the highest pitch of abnegation, as among the Phœnicians none but only-begotten children could be offered to the gods.

First-fruits, an offering to God required by the Hebrew law, and consisting of the first ingatherings of the harvest, or of food made therefrom. They were of two kinds, public and private, and each class included both *Bieurim*, a raw produce, and *Terumoth*, produce prepared for human use. The public offerings were four—the first-fruits of all ripe fruits and liquors, presented in God's house; a sheaf of corn at the Passover; two loaves of leavened bread at the Feast of Pentecost; and the harvest offering at the Feast of Tabernacles. Among private offerings were the first-fruits of all lands, and a cake made from the first dough which was baked.

Fir Volgs, or FIRBOLGS, a race who overran Ireland, probably during the period now known as the Bronze Age. They are supposed to have been Britons. According to tradition, they were led by five chieftains and made their appearance in three bodies, which landed in Wexford, Mayo, and Ulster respectively. They were themselves vanquished by another invading race, the Tuatha Dé Danaum, but there are traces of them long afterwards, and they are believed to have formed the chief element in the Irish population as late as the 6th century.

Fischart, JOHANN (1545–1589), a German satirical writer, was born at Mainz. Not much is known of his life, except that he was a Doctor of Laws, and in the latter part of his life was bailiff of Forbach. His satires, partly verse, partly prose, are humorous and sometimes obscene, and attack freely the follies of his time. He was a sort of German Rabelais, and took great liberties with his native tongue, being compared in this respect to Aristophanes. He wrote an imitation of Rabelais, and one of his chief works was *Das gluckhaft Schiff von Zurich*.

Fischer, ERNST KUNO BERTHOLD, a German philosopher, born in Silesia in 1824. He was educated at Leipzig and Halle, where he studied philosophy, and in 1850 established himself in Heidelberg as a *privat-docent*, but three years afterwards the Government deprived him of this post, probably on account of unorthodox views. In 1856 he obtained an appointment at Jena, and in 1872 was reappointed without opposition or interference at Heidelberg. His great work is a *History of Modern Philosophy*, in which he treats of Spinoza and the Cartesians, of Leibnitz, of Bacon and his successors, of Kant, of Fichte, and of Schelling. He also wrote other books, especially a *System of Logic and Metaphysic*. He has had great influence upon German contemporary thought.

Fish, HAMILTON, an American statesman, was born at New York in 1808, and called to the State bar in 1830. He was returned to Congress in 1842, and in 1847 became Lieutenant-Governor, and Governor in 1848. In 1853 he became a member of the United States Senate, and from 1869–77 was Secretary of State, in which capacity he was concerned in the Washington treaty of 1871, and in the settlement of the *Alabama* question.

Fish Hawk, Fishing Eagle. [OSPREYS.]

Fish Owl, a name for two genera of Owls (q.v.). Ketupa from India, and Scotopelia from Africa. Fish is their favourite diet, but when this fails, no kind of animal food comes amiss to them.

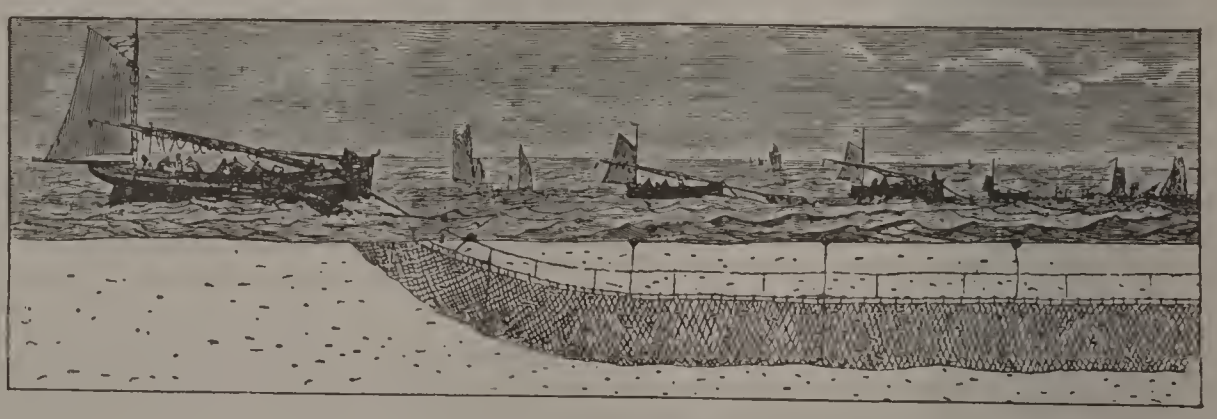
Fisher. [PEKAN.]

Fisher, JOHN (1459–1535), an English ecclesiastic, was born at Beverley, in Yorkshire. He was educated at Cambridge, and obtained a fellowship, and became head of a house. He took orders, and became confessor to the Lady Margaret of Richmond, and was the first Margaret Professor of Divinity. He became Chancellor, and in 1504 was nominated Bishop of Rochester. He was a great opponent of Protestantism, but, on the other hand, was consistent, and refused to look on the king's marriage with Katharine of Aragon as unlawful. The Court party determined his destruction, and first attainted him in 1534 as an accomplice of the Maid of Kent. He was sent to the Tower, and deprived for refusing to recognise the king's new marriage, and when the Pope sent him a cardinal's hat in 1535 the king declared he should have no head to wear it on. Accordingly he was trapped into denying the king's spiritual supremacy, was tried, condemned, and beheaded. He left behind him a commentary upon the Penitential Psalms, and other theological writings.

Fisheries. The regular pursuit of fish for food or as a commercial commodity evolved with the growth of society from an individual act to satisfy an individual want to a complex collective business, from fishing to a fishery. The process is easily traceable among living nations. Fishing has naturally had an important place among the industries of maritime countries. In some cases—Holland and Scotland, for instance—it has figured prominently in the national history; in some others—notably Newfoundland and the Behring Sea—it has caused serious international disputes.

Value of Sea Fisheries. To measure the value of inland fisheries, except in a few cases, is impossible; but the Board of Trade is responsible for the following official estimate of the most important sea fisheries, the figures representing the total value at first hand:—United Kingdom, with Scotch and Irish salmon (1891), £7,570,000; France (1889), £3,853,000; Canada (1890), £3,691,000; Norway (1890), £1,234,000. For the United States and Holland we have no official estimate; the fisheries of the former probably at least equal our own in value, while the Dutch probably range after the Norwegian. The value of our own fisheries in the wholesale markets is probably quite fifteen millions sterling. The most important single fisheries of other nations are as follows: Canada—cod, pickled herring and mackerel, and preserved salmon and lobster; France—"prime" fresh fish, cod, oyster, herring, sardine; Norway—cod, herring, mackerel; Holland—cod and herring. The American shad, Dutch oyster, and Italian sardine are also familiar and valuable. The French fisheries employ 146,000 men, the Canadian 64,000, and the Norwegian at least 112,000. The Arctic whale fishery has gradually declined owing to the scarcity of fish and the increasing use of other oils and gas.

British Inland Fisheries. These being mainly used for sport only call for brief mention. The salmon (q.v.) is, however, commercially important, the annual value of the market consignments being about £200,000. Scotland sends 25,000 one-cwt. boxes, Ireland 10,000, and England 2,750, to



DRIFT-NET FISHING.

Billingsgate annually. Pollution of rivers has done much mischief. The chief British salmon streams are the Tay (which alone gives an annual rental of nearly £17,000), the Spey, Tweed, and Esk, the Shannon, the Severn, and the Tyne.

The British Sea Fisheries are pursued mainly according to five methods. Of these trawling has become the most important. The trawl-net is a long bag, depending from a beam from 15 to 50 feet long and raised 3 or 4 feet from the ground at each end. It is dragged along the sea-bottom for several hours at a time; and when hauled in the lower or "cod" end is unlaced and the catch discharged. The trawl can only be used on soft, flat bottoms; it takes bottom fish. that is, all the flat food fish: sole, plaice, turbot, halibut, brill, flounder, skate, etc. Beam-trawling has rapidly increased during the last decade, especially at the ports nearest to the great North Sea "banks," Hull and Grimsby, Shields, Aberdeen, and Leith. Steam-trawlers are gradually supplanting the old sailing vessels; and fast steam "carriers" attend the big fleets of the fishing companies and take their catches to market. The operation of "boarding" the boxes of fish from the smack to the carrier is constantly one of the dangerous parts of the fisherman's vocation. Oysters (q.v.) and shrimps are taken with smaller forms of the trawl-net.

In drift-net fishing the fish—surface fish, especially herring, mackerel, pilchard, sprat, smelt. and whitebait—enmesh themselves in the net, which, like a curtain. drifts perpendicularly with the tide a few feet below the surface. A fleet or train of herring nets extends 1½ miles, and one of mackerel nets often over two miles. Herring fishing takes place at night-time, and usually within 30 miles of shore, the catches being landed daily. The chief season is from August to October; the spring fishery is less important. Yarmouth and Lowestoft are the chief English centres. Mackerel is caught almost exclusively on the south and west coasts from May to autumn.

The seine net, of which there are several varieties, is made to encircle the fish, not to enmesh them; it is leaded so as to float perpendicularly, being shot in a circle if worked from a boat, or in a semicircle if worked from shore. It is used largely on the Cornish coast for mackerel, pilchard, herring, and sprat.

TRAWLING.

Line-fishing with hook and bait is mainly used for cod, haddock, ling, and halibut. A full train of "long" lines measures over six miles, and carries nearly 5,000 hooks, mussels, whelks, etc., being used as bait. "Hand" lines are much shorter. Cod-smacks are built with a "well" in which the fish are kept alive till landed, when they are transferred to large floating chests to await market exigencies. Large steam vessels now go long voyages, especially to Iceland and the Faröes from Grimsby and Aberdeen.

Fixed nets and engines include stow-, trim-, and kettle-nets, weirs, trammels, and crab and lobster pots.

The Fishing Fleets. Over 28,000 fishing-boats were registered in the United Kingdom in 1891, the regular crews numbering over 100,000. This, of course. represents only a small part of the whole population employed. England has 8,400 boats (mostly of large size) and 33,000 hands; Scotland 14,000 boats with 45,500 hands (the smallest number since 1875); and Ireland 6,000 boats (very few of the first class) with 22,000 hands. The chief English centres are Grimsby (which boasts itself the metropolis of the fishing world) with over

800 boats and 5,000 regular fishermen, Hull with 550 boats (500 of them "first-class") and 2,800 hands, Yarmouth with 680 vessels, and Lowestoft with about 400. The most valuable single fisheries from English and Welsh ports (the sums being the annual value at the landing-place in 1891) are: haddock, £884,000; plaice, £670,000; herring, £503,000; soles, £517,000. The total value of sea-fish landed on the English and Welsh coasts in 1891 was £4,500,000. "Prime" fish is getting scarcer and dearer.

In Scotland almost all the fisheries ports are on the east coast. Banff and Peterhead have each about 1,100 boats, Inverness 1,600, and Wick, Stornoway, Kirkcaldy, and Greenock large fleets. Aberdeen is developing a large beam-trawling business. Of £1,829,000 worth of sea-fish landed in Scotland in 1891 the herring contributed £918,000. The haddock fishery is rapidly growing. Herring-curing engrosses in the season the energies of whole communities. It has been so often described as to be familiar. The Government Brand, established in 1809, has since 1858 contributed substantially to harbour works, etc. It is not compulsory, but is of obvious value as a certificate of quality in the Continental markets, whither 98 per cent. of the branded barrels are sent. The total Scotch cure has multiplied fifteenfold since 1809, and doubled in the last twenty years; it now amounts to about 1,350,000 barrels annually. Besides the regular fishermen, over 52,000 persons are intermittently employed in connection with the Scotch fisheries, chiefly in the summer herring season.

The leading centres in Ireland are Dublin with 146 first-class boats. Galway with a thousand small boats, Skibbereen, Westport, Sligo, Londonderry, and Cork. The total value of fish landed in 1891 was only about £308,000, and of this sum mackerel contributed nearly half. Only half the boats engaged in the Irish mackerel fishery are Irish; there are many French visitors. Kinsale, Castletownbere, Baltimore (where there is an admirable fishing school), and Valentia are the principal landing-places. Part of the mackerel catch goes direct to the English markets, and part is salted and barrelled for America.

Administrative Aspects. The economic importance and the scientific interest of the fisheries have both been more widely appreciated in recent years. The example of the United States and several Continental Governments has not been altogether lost. We have, however, still quite a number of scattered authorities acting in a disjointed and ineffective way; and we are not yet through the pre-scientific period of inquiry by Royal Commission and Parliamentary Committee. Things were hardly bettered by the transfer of English fisheries business, in 1886, from the Home Office to a new, but small and ill-equipped, department of the Board of Trade. For the protection of freshwater fisheries the various English waters have been partitioned into districts—now fifty-one in number—each with its Board of Conservators to enforce close seasons, etc. In 1891 these Boards issued nearly 10,000 salmon and 45,000 trout licences. As regards the English and Welsh Sea Fisheries, the Harbour and Marine Departments of the Board of Trade, the Admiralty, and the Foreign Office all have certain functions. A primary distinction must here be noted between national and international—*i.e.* territorial and extra-territorial—waters; the former extend 3 miles from the land, beyond which limit all fishing is free save as it may be regulated by International Convention. The most important of these Conventions are that of 1882, providing for the policeing of the North Sea, and that signed at the Hague, in 1887, for the prohibition of the drink traffic among fishing boats. Under the Sea Fisheries Regulation Act of 1888 a chain of local committees has been gradually formed round the English and Welsh coasts; and these have power to restrict or prohibit particular methods of fishing in territorial waters, and to protect and develop shell-fisheries. The latter object is also provided for under the Oyster, Crab, and Lobster Act of 1877, etc.

Scotland has long enjoyed a more sensible administration. In 1882 the old "Board of White Fishery" was supplanted by the new Fishery Board, which at once adopted a larger programme. Surveys of fishing grounds, careful and sustained scientific investigations, and experiments in "pisciculture" (q.v.) have been set afoot. The other duties of the Board—beside the working of the herring brand—have meantime increased. Under the Act of 1885 it may regulate or prohibit inshore fishing; it manages the numbering, etc., of boats, collection of statistics, settlement of disputes, and granting of loans to fishermen, and advances for harbour works and telegraph extension. All the powers of the Board of Trade respecting shell-fisheries have been given over to it. It has its own officers in twenty-six districts. Proposals have several times been before Parliament for the reorganisation of the Board on a representative basis, the creation of district committees, and the development of shell-fisheries through their agency. Professor Ewart and other members of the Board have found time to help forward the movement for the technical education of fishermen. The Scotch salmon and freshwater fisheries are administered by the Fishery Board and district boards acting mainly under the Acts of 1862 and 1868, the inadequacy of which is a subject of complaint. (*See* Mr. Archibald Young's report to the Board in 1890.) The right of salmon fishing is the property of the Crown, being granted or leased by the Commissioners of Woods and Forests; it is "emphatically an heritable estate," and is commonly subject to lease. Scotch rights thus differ from English, which are held by the Crown only in trust for the people, and are really public. The Tweed and Solway Fisheries are under special legislation; and this fact, and the differences between English and Scots law, have given rise to endless litigation. (*See* Stewart's *Law of Fishing*, and Report issued in 1890 of Commission on Crown Rights of Salmon Fishing in Scotland.)

The Irish fisheries have suffered at the hands of English governors. In 1819 a Fishery Board was established to extend to Ireland the system of bounties which England and Scotland had already

enjoyed, and the enormous impetus given to the industry lasted long after its cessation in 1830. No compensating grants were established, as in Scotland, and the famine of 1847–48 commenced the decay which has steadily continued down to the last decade. The Fishery Board was re-established in 1869, and loans and grants have been regularly made out of the Irish Reproductive Loan Fund (1874) and the Sea Fisheries Fund (1883). About £800,000 had been spent up to 1888 on fishery harbours; but much of this had certainly been wasted. The freshwater fisheries are administered by Boards of Conservators under the nominal control, often defied, of the Fishery Board. Fishing in territorial waters is hedged about by many restrictions. The richness of some of the Irish fishing grounds is beyond question; but better railway service between coast and markets, better boats, instruction in net- and line-making and fish-curing, a more vigorous initiative in public oyster farming, a thorough survey of the western waters, and an all-round strengthening of the Fishery Board, are sadly needed.

The Fishmongers' Company—which is one of the oldest of the metropolitan guilds—occupies a sort of semi-official position. Its main public duties are now the inspection of London fish-markets, and condemnation of "unsound" fish, the prosecution of offenders under the Sea Fisheries Acts, and the suppression of the trade in "unseasonable" salmon. It also helped to launch the highly-successful International Fisheries Exhibition of 1885, the last of a series in which Arcachon (nearly twenty years before), the Hague, Berlin, Norwich, and Edinburgh were pioneers. The volumes issued by the Exhibition executive together with the annual blue-books of the various fisheries departments would alone make a goodly fisheries library. One of the results of the Exhibition was the formation of the Marine Biological Association, which has a marine "laboratory" at Plymouth. The National Sea Fisheries Protection Association, the Royal Dublin Society, the National Federation of Fishermen, and the Missions to Deep Sea Fishermen deserve mention.

The Exhaustion of Fisheries. The improvement of railway communication and market facilities, the introduction of steam vessels, and the multiplication of fleets, together with the gradual failure of inshore fisheries and the alleged strain upon the much-frequented "banks," have served to thoroughly alarm the older fishing communities, and the "immature fish question" is everywhere anxiously debated. An International Conference, at which Belgium, Denmark, France, Germany, Holland, Spain, and Great Britain were represented, was held in London in 1890, and it was resolved that scientific inquiries should be carried on in each country preparatory to another and official conference. Meanwhile the British Government was asked to prohibit the sale of soles or plaice less than 10 in., lemon soles less than 11 in., and turbot and brill less than 12 in. in length. Of the general fact of a useless and probably ultimately disastrous slaughter there is no doubt; and, apart from immature fish, it seems certain that continuous fishing in limited areas will prevent the natural reproduction of the less prolific species. The beam-trawler is the chief offender, for his catches particularly are of the large uncommon and valuable kinds. Of course, to stop the sale of fish under a certain size will not completely stop their capture. On the latter point little definite can be said pending further scientific researches, such as the Scotch Board, the Marine Biological Association, and foreign observers are carrying on. The relation between size and maturity is almost unknown at present; and a net which will let the young of large fish escape and yet catch the mature of smaller species is yet to be devised. To kill a nearly mature fish is worse than killing many very small ones, it should be remembered. Three suggestions can be made: (1) that the trawl should be raised more often, so that small fish may be returned to the sea before dead; (2) that known fish "nurseries" should be protected; and (3) that shrimp trawling and certain other modes of fishing in territorial waters (where, however, the valuable food-fishes rarely spawn) should be restricted or prohibited. It is possible that to some extent the food and habitat of bottom-fishes are injured by beam-trawling. It has, however, been established that it does not destroy the spawn, for Sars, McIntosh, and Raffaele have shown that the eggs of all these valuable fish float.

On these and other problems concerning fish-life, food, reproduction, migration, and artificial propagation, valuable papers will be found in the annual reports of the Scotch Fishery Board.

Fishes (*Pisces*), a class of vertebrate animals forming with the Amphibia (q.v.) Huxley's primary group or province Ichthyopsida (q.v.). Aristotle, the father of Natural History, in the 4th century B.C. knew how to separate fishes from the higher aquatic mammals and the lower aquatic invertebrates, but for a long time the term Fishes was used very vaguely. In modern times, Ray (1628–1705) seems to have been the first to attempt a separation of whales from fishes, but afterwards, as if frightened at his own daring, invented a definition which included both. However, since the days of Linnæus, the distinction between cetaceans and fishes has been clearly made, and the biological researches of the last half of the 19th century have led to the marking off of Amphioxus and the Cyclostomata on the other side, so that the boundaries of the class may be said to be pretty clearly defined.

Fishes are aquatic vertebrate cold-blooded animals, having the body divided internally into a number of segments or myocommas, and usually covered with scales. They possess a dorsal nerve-cord, enlarged at the anterior end to form a brain, and a notochord generally replaced by a backbone. The heart consists of a single auricle and a single ventricle (except in the Dipnoi, where there are two auricles); gills persist through life. The limbs, when present, are in the form of paired fins, without true digits, and not divisible as in higher vertebrates, into arm, fore-arm, and hand, or thigh, leg, and foot respectively. Unpaired fins are often

present in the shape of a fold of the skin, supported by slender flexible cartilaginous or bony rays connected by a thin membrane.

There is evidence that fishes existed in Upper Silurian times, though this evidence is fragmentary, consisting of spines, scales, and head armour. In the Devonian, fish remains are so abundant that that epoch has been called the "Age of Fishes," and down to the end of Palæozoic times Ganoids predominated. In secondary strata the Dipnoi and Teleostei appear, the former in the Permian, the latter not till the Chalk, and of the fossil forms in Tertiary strata more than half belong to existing genera, though the distribution was very different from that of the present day.

Fishes may be conveniently classified as follows:—

Sub-Class I.—Palæichthyes (Ancient Fishes).
- Order I.—Chondropterygii (Cartilaginous Fishes).
  - Sub-order I.—Plagiostomata (Fishes with oblique mouths).
    - Group A.—Selachoidei (Sharks).
    - Group B.— Batoidei (Rays).
  - Sub-order II.—Holocephala (Chimæroids).
- Order II.—Ganoidei (Ganoids).
  - Sub-order I.—Placodermi (Bony-plated Fishes).
  - Sub-order II.—Acanthodini (Fishes with spines in front of some of the fins).
  - Sub-order III.—Chondrostei (Ganoids with cartilaginous skeleton).
  - Sub-order IV.—Polypteroidei (Fishes with the dorsal fin greatly divided).
  - Sub-order V.—Pycnodontoidei (Fishes with molar-like teeth).
  - Sub-order VI.—Lepidosteoidei (Fishes with bony scales).
  - Sub-order VII.—Amioidei (American Mud-fishes and their ancestors).
- Order III.—Dipnoi (Lung-breathing Fishes).

Sub-Class II.—Teleostei (Bony Fishes).
- Order I.—Acanthopterygii (Spiny-finned Fishes).
- Order II.—Acanthopterygii Pharyngognathi (Spiny-finned Fishes with the pharyngeal bones united).
- Order III.—Anacanthini (Soft-finned Fishes).
- Order IV.—Physostomi (Fishes with the air-bladder opening into the mouth).
- Order V.—Lophobranchii (Fishes with tufted gills).
- Order VI.—Plectognathi (Fishes with the jaws united).

As will be seen from the list given above and from the article Cartilaginous Fishes (q.v.), the

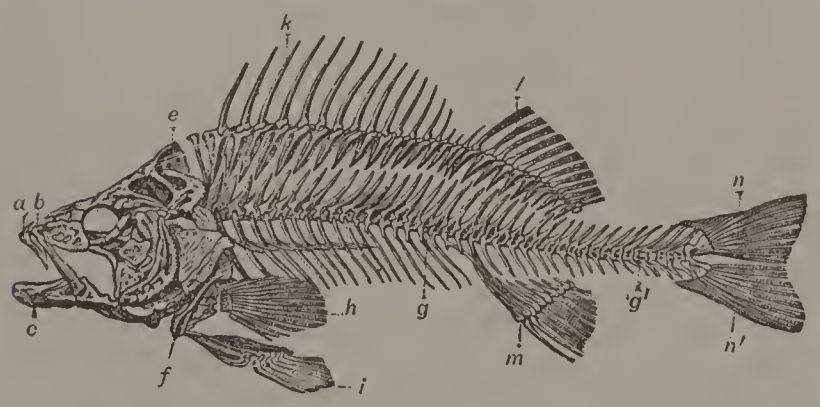


Fig. 1.—Skeleton of Perch.

a, Pre-maxillary bone; *b*, maxillary bone; *c*, lower jaw; *e*, skull; *f*, interoperculum; *g*, *g'*, spinal column; *h*, pectoral; *i*, ventral fin; *k*, *l*, dorsal fins; *m*, anal fin, *n*, *n'*, caudal fin.

skeleton of the oldest forms is composed of gristle, not of true bones, as anyone may satisfy himself by examining the skeleton of a skate. This is only to be expected, considering that the forerunners of true fishes—Amphioxus, the Hag, and Lampreys—have no bony framework. This state of things still persists in the Sharks and Rays and in the Ganoid Sturgeons, while in other Ganoids and in the bony fishes the skeleton is more or less ossified. The Perch offers a good example of the skeleton of a bony fish.

The axial skeleton consists of a vertebral or spinal column, terminating at the anterior end by a cranium or brain-box and the bones of the face, and at the posterior end by the tail. Each vertebra

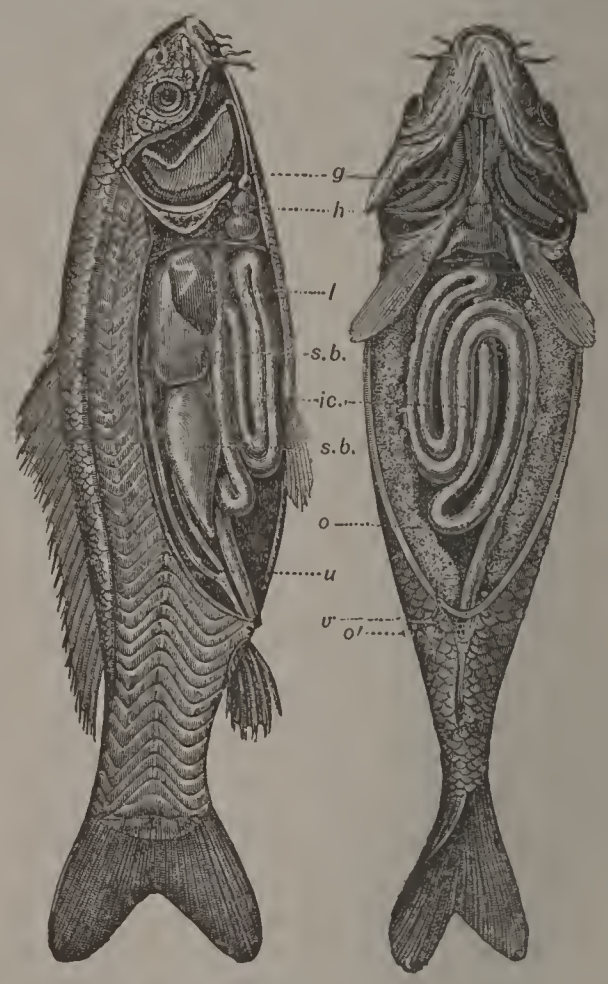


Fig. 2.—Anatomy of the Carp.

g, Gills; *h*, heart; *l*, liver; *s b*, swimming bladder; *i c*, intestinal canal: *o*, ovaries; *o'*, oviduct; *u*, urethra; *v*, vent.

is hollowed out before and behind (except in the American bony pike, where the front part is convex and the posterior part concave). The jelly-like remains of the notochord fill up the cavities between the vertebræ, which are bound together by ligaments, and allow great flexibility of movement. Only two regions can be discriminated in the spinal column—the abdominal and the caudal. The vertebræ in the former region possess a neural arch, through which the spinal cord passes, and two transverse processes serving for the attachment of the ribs. These two processes are wanting in the caudal vertebræ, which have, however, an inferior arch carrying a spine, and to these arches and ribs the term hæmal is applied.

There is no thoracic cavity, as in the higher vertebrates; and the ribs, which generally give off a spine-like bone posteriorly, are imbedded in the muscles. The interspinous bones above and below bear the median fins (*see* the bones bearing dorsal (*k*, *l*) and anal fins (*m*) in Fig. 1), and are connected by ligaments with the neural spines.

The skull is a brain-box formed from modified vertebræ, and bearing capsules for the sense-organs.

In Cartilaginous Fishes this brain-box is gristly, but in all others it is more or less completely ossified. In front of the brain-box are the bones or cartilages that form the framework for the mouth and face. Behind the head the gills or branchiæ are situated, and the cavity containing them opens exteriorly by the gill-slit. This is closed by the gill-cover, by which the gill-chamber can be opened or shut. The gill-cover or operculum is made up of four flat bones united by a membrane. The innermost, which articulates with the skull, is called the præoperculum, and then comes the operculum proper, the inter-operculum, and the sub-operculum.

The fins of fishes are *paired* or *horizontal*, and *unpaired* or vertical. The former consist of two pairs, the pectorals and ventrals, and are the representatives of the limbs of higher vertebrates; the latter are mere outgrowths of the skin supported by bony rays. The pectoral fins are carried by the scapular arch, and the ventrals by the pubic bones, which constitute an imperfect pelvic arch, never united to the vertebral column. In abdominal fishes—those having the ventrals near the posterior end of the body—these bones are suspended in the muscles; in the thoracic and jugular fishes which have the ventrals below or in front of the pectorals respectively, the pelvic arch is attached to the scapular arch. In some fishes a sucking disk is formed by the coalescence of the ventrals. The unpaired fins are in the median dorsal and ventral line, and in their simplest form consist of a fold of skin surrounding the end of the tail. They generally consist of one or two outgrowths of skin on the back, called the dorsal fins; of similar outgrowths of the under surface near the vent, called the anal fins, and a broad fin at the posterior end of the body, called the caudal fin or tail. In addition to the rayed dorsal, many soft-finned fishes—the Salmon family, for example—have an additional fin without rays, and as this consists of a mere fold of skin containing fat, it is called the adipose fin. The adhesive disk of the sucking fishes is formed by a modification of the dorsal fins. The tail is set on vertically, thus differing from that of the Cetaceans, which is horizontal. When the lobes are decidedly unsymmetrical, the tail is said to be *heterocercal*; it is *diphycercal* if the fin rays are divided by the end of the spine into two equal, or nearly equal, portions; and *homocercal* if the notochord is prolonged into the upper lobe. The tail is the great organ of progression, the paired fins being used chiefly to direct rather than to impart motion. The body may be naked, but is generally covered with scales developed in the true skin. These differ greatly, and on their characters Agassiz (1807–1873) founded a scheme of classification on these differences, being chiefly influenced by his knowledge of fossil forms. *Cycloid* scales—those of most of the Bony Fishes—are thin and flexible, round or elliptical in shape, and generally with a smooth outline. *Ctenoid* scales have the hinder edge spinous or cut into comb-like teeth. *Ganoid* scales are angular and bony, and covered with a thin layer of enamel (ganoine). The so-called *Placoid* scales are in no sense true scales, but ossified dermal papillæ (shagreen), and bony plates, which in the Rays are often armed with a spine. The principal muscle lies along the sides of the trunk and tail, and is made up of a number of smaller segments, one for each vertebra. The brain is always small, and in the adult never fills the whole of the cranial cavity. In the Pike, for example, the proportion of the weight of the brain mass to that of the whole body is as 1 to 1300; in man it is twenty-six times as much, or as 1 to 50. The whole nervous system is relatively much smaller than in the higher animals. The eyes vary greatly; they may look upwards, downwards, or sideways, be

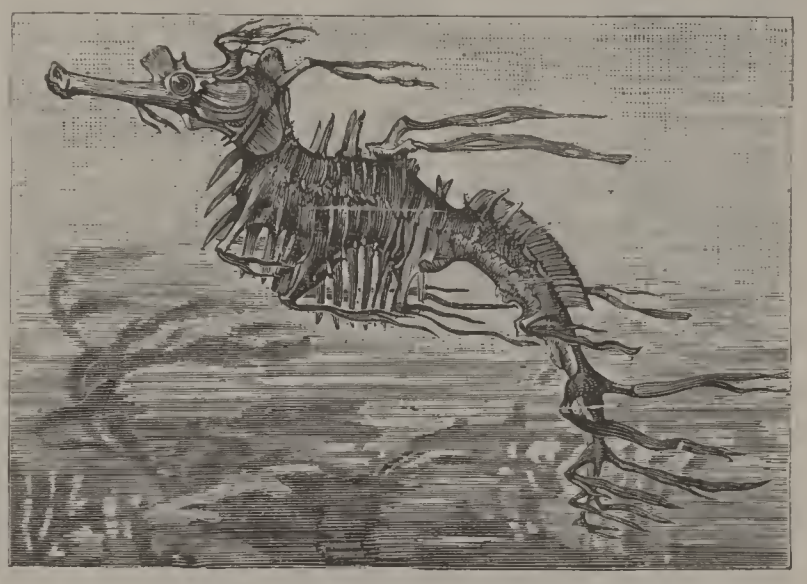


Fig. 3.—PROTECTIVE RESEMBLANCE IN PHYLLOPTERYX.

close together, or even on the same side of the head, as in the Flat Fishes (q.v.). When they are abnormally large, it is an indication that the fish either lives at a great depth or is nocturnal. In Periophthalmus they can be thrust far out of the socket, and can see in air as well as in water, and in Uranoscopus they are so completely on the upper surface as to justify the name of Star-gazer. There are two nasal sacs, lined with membrane, with a single or double exterior orifice. Only in the Dipnoi do these sacs open posteriorly into the mouth. The passive sense of smell seems to be possessed by all, or nearly all, fishes, while the active sense of scent is probably confined to the predatory forms, as the Sharks, etc. There is no tympanic membrane or external ear. In the Cartilaginous Fishes an auditory passage reaches to or opens into the skull, where the labyrinth is situated, and in many of the Bony Fishes there are spaces in the skull near the internal ear, covered with skin or thin bone, while in others, as in the Perches, there is a connection between the swim-bladder and the ear, which seems to foreshadow the Eustachian tube. The tongue is little developed, and there is not much evidence as to the sense of taste. Dr. Günther thinks that it cannot be acute, and that a peculiar organ on the palate of Carps is connected with this sense. Most fishes are sensitive to touch, and sensory cells are distributed over the skin. Barbules—whence the popular name of the Barbel (q.v.)—and the filamentous appendages of many other fishes are tactile organs, as are the detached

rays of the pectorals in some families, though these may also be used for locomotion, as in the Gurnards. Fishes are voiceless, though some of them produce sounds, which are probably involuntary ; in others the sounds are produced by the rubbing of some of the neural spines on the posterior part of the vertebral column.

The mouth is generally armed with teeth, though some fishes, as the Sturgeons, have none. The Bony Fishes have teeth not only on the jaws, but

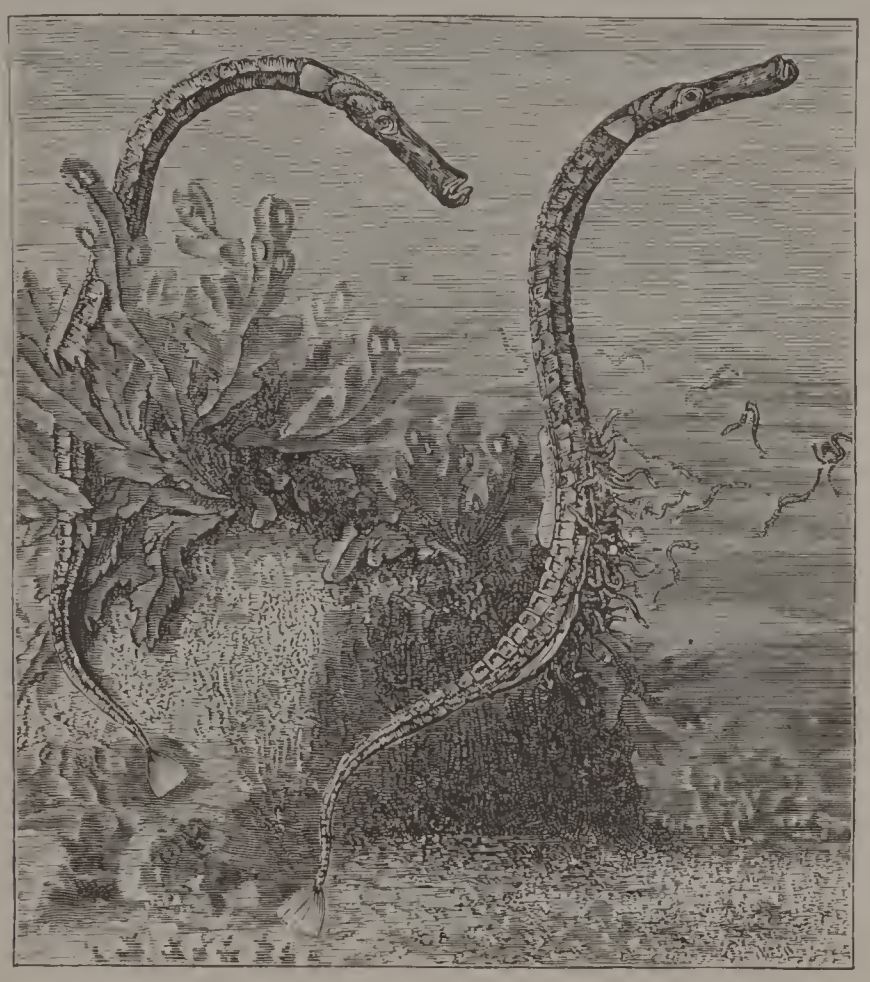


Fig. 4.—BROAD-NOSED PIPE-FISH (*Siphonostoma typhle*) WITH YOUNG ESCAPING FROM THE BROOD POUCH OF THE MALE.

distributed more or less over the bones of the mouth. The alimentary canal consists of a gullet, stomach, small and large intestine, though in some cases these divisions are not apparent. In the Cartilaginous Fishes and Dipnoi the absorbent surface of the intestinal canal is increased by a spiral valve, which winds in close turns from the straight intestine to the cloacal vent. In the Bony Fishes its place is supplied by a number of blind tubes (the pyloric cæca), and there is no cloaca. The urino-genital pore in the class is distinct from and behind the anus, and the urinary pore is, as a rule, separate from and behind the genital. The liver is usually large, soft, and oily, and in the Cods is of importance in medicine and commercially. The kidneys are very large, extending, beneath the spine, from end to end of the abdominal cavity. They are important, because by their means biologists have been able to trace the development of the urino-genital system in the higher animals from a primitive excretory duct. The heart, except in the Dipnoi, receives venous blood only. This is poured into the auricle, thence into the ventricle, and through the branchial artery to the gills, through which it is distributed by the branchial vessels. After aëration it is not returned to the heart, but propelled through the systemic vessels of the body. In the Dipnoi the heart receives arterial as well as venous blood. Fishes breathe by means of their gills oxygen dissolved in the water in which they live. The water flows in at the mouth, and, after parting with its oxygen, out at the gill clefts. The gills persist through life, and generally form a series of flat, elongated, pointed leaflets or plates, carried on the branchial arches, and covered with mucous membrane, through which the branchial capillaries run. In some embryonic forms the gills are filaments ; in the Lophobranchs (q.v.) they are in the form of small lobes ; and in the Sharks they are not covered by an operculum. The swim-bladder, arising as a dorsal outgrowth from the intestine and often communicating with the gullet, though chiefly hydrostatic in function, is the homologue of the lung, and is developed into that organ in the Dipnoi, thus linking them with the Amphibians. In fishes which live principally at the surface the swim-bladder is small, and it is absent in the Flat Fishes.

The sexes are distinct, but individual abnormalities occur, as in higher animals. In the European species of Serranus, a testicle-like body is sometimes attached to the lower part of the ovary, but even in this genus the sexes are generally distinct. Most of the class are oviparous; the generative organs of the female are commonly known as "hard roe," and those of the male as "soft roe," or "milt." The eggs are generally deposited in the water, a small quantity of the male element serving to fecundate a large number of them dispersed through a considerable space. In the oviparous cartilaginous fishes the egg is deposited in a flattened oblong case locally known as sea-purses, the ends of which are produced into filaments serving to anchor the case and its contents. In the viviparous sharks the posterior pair of fins are modified to form "claspers," which hold the female during fertilisation, which must necessarily be internal, when the young are produced alive (as they are also in some bony fishes) or when the ova are enclosed in cases. When hatched the young still carry the yolk-sac, which serves to nourish them till they can feed themselves ; but many of them differ so widely from the parent forms that not a few have been described as distinct genera. In only two genera do the females show any care for the ova ; in the Siluroid genus Aspredo they are attached to the belly, and in the Lophobranch Solenostoma a pouch is developed, probably for their reception. When any care is shown for the eggs or young, it is on the part of the male. The stickleback builds a nest, in which the ova are developed [*see* illustration under ACANTHOPTERYGII], as do some others ; and the males of most of the Syngnathidæ have egg pouches or carry the ova glued to the abdomen, and in some cases the young when alarmed seek this pouch for shelter.

Although many fishes, especially in the tropics, are brilliantly coloured, some take on the hues of the surroundings very closely, as do the flat-fishes.

Protective resemblance exists among the Lophobranchs, and is carried to a high degree of perfection in the Australian genus Phyllopteryx. The colour of these small fish is like that of the sea-weed among which they live, and the long waving appendages of their spines look to be vegetable rather than animal. Fishes are the hosts of many parasites—from Cyclostomes to tapeworms; and some in their turn are commensal, as Fierasfer with Holothurians, and the young of the bass and sticklebacks with Medusæ. Specimens of these two fish, taken from their host, are in the Natural History Museum, South Kensington. An imperfect form of hibernation occurs in many Cyprinoids and Murænoids, the vital functions being greatly lowered but not suspended. In tropical countries in time of drought many fish bury themselves in mud, and some of the Dipnoi prepare a kind of mud-case lined with hardened mucus in which they can live for some time.

Fishes may be fresh-water or marine, and some frequent the brackish water of estuaries. The marine fishes fall into three groups. (1) *Shore Fishes*, living in the immediate neighbourhood of the land, the majority keeping near the surface, and few descending to more than 300 fathoms. (2) *Pelazic Fishes*, living near the surface and in upper regions of the open sea, on approaching land in search of prey or to spawn. (3) *Deep-Sea Fishes*, which inhabit the depths of the ocean. Although these groups are convenient for description, they are by no means sharply defined, and pass into each other at many points. Some fishes are vegetable feeders, but the majority live on some kind of animal food—infusorians, jelly-fish, molluscs, crustaceans, small fish, and in some cases warm-blooded animals, while a few are scavengers. Fishes are economically important to man as food [Fisheries, Pisciculture], and in a less degree for the oil, isinglass, and shagreen obtained from some of them. The flesh of some few fishes, however, is either constantly or occasionally poisonous, causing acute inflammation of the stomach and intestines, and sometimes death. These results are said to be due to the fact that these fish feed on poisonous medusæ, corals, or substances in a state of putrefaction. Those living on certain coral banks in the West Indies are poisonous, and during the spawning season the roe of the Barbel, Burbot, and Pike acquire deleterious qualities. Poison-organs are sometimes developed for purposes of defence, not for procuring food. These organs may consist of perforated spines connected with a poison bag, as in the Scorpænoid Synanceia, from the Indo-Pacific, and the Batrachoid Thalassophryne from the coasts of Central America; of solid jagged spines as in the Sting Rays, where the mucus secreted by the skin is the poisonous agent; or of a grooved spine charged with a similar mucus, as in the Weever.

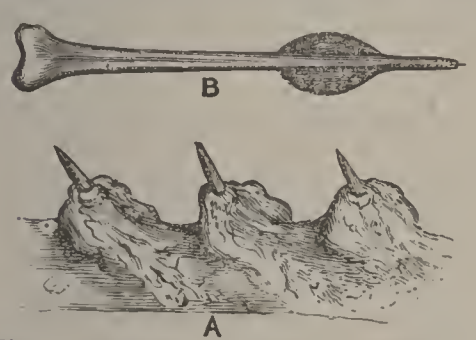


Fig. 5.—Poison Organs of Synanceia (*from specimen in Natural History Museum, South Kensington*).

A, Dorsal spines of *S. verrucosa*; B, spine dissected out, showing poison-bag.

Fishes Royal, a name applied to whales and sturgeons, which, when caught near the coast or thrown on shore, are the property of the Crown.

Fishing. [Rod-Fishing, Salmon, Trout, etc.]

Fishing Frog. [Angler Fish.]

Fissipedia. [Carnivora.]

Fissirostres, a lapsed group of Passerine birds, of which the swallows, swifts, and goat-suckers were the chief representatives. The distinguishing characteristic was a short beak, wide in the gape, and bordered with bristles to prevent the escape of the insect prey.

Fistula. A narrow track communicating externally with the skin and internally with a mucous surface is called a fistula. Such a condition of things may arise from error of development, as in the branchial fistulæ of the neck, or may result from disease or injury. The most common form of fistula is *fistula in ano*. It owes its origin to the formation of an ischio-rectal abscess which bursts internally into the lower bowel and externally upon the skin. The unnatural track of communication thus formed is very prone to remain open, giving rise to chronic discharge of offensive matter from the cutaneous opening. Other forms of fistula are *lachrymal fistula*, where there is a track of communication between the lachrymal sac and the skin of the face, *salivary fistula*, *biliary fistula*, and the like. The cure of fistula usually resolves itself into a question of operative treatment.

Fitch, John (1743–1798), was born in Connecticut, and during the Revolution was a gunsmith. He then made some expeditions to the west, and was captured by Indians, but escaped. In 1785 he made a model of a steamboat, and in 1789 made a trial trip with a steamboat on the Delaware. In 1790 he ran a passenger boat for 20 miles, and in 1793 went to France to advance his views. The Revolution upset his plans, and he came home penniless. It is a question whether later boats were not modelled upon his plans deposited in France.

Fits. [Convulsions.]

Fitzgerald, Edward (1809–1883), an English scholar born in Suffolk. At an early age he went to France, but in 1821 he was sent to Edward VI.'s grammar school at Bury St. Edmunds. In 1826 he went to Trinity College, Cambridge, where he was contemporary and intimate with Thackeray and Thompson (afterwards Master of Trinity). Tennyson also was there at the time, but the two did not become acquainted till later. After taking his degree he adopted a quiet country life, enjoying the acquaintance of the son of Crabbe the poet, Donne, Spedding, and Thackeray. He also formed an acquaintance with Tennyson and Carlyle. In 1852 he produced the two dialogues *Euphranor* and *Polonius*. He then began to study Spanish, translated Calderon's plays, and delighted in *Don Quixote*.

In 1852 his attention was directed to Persian. He studied it enthusiastically under the direction of E. B. Cowell, and translated some of the Oriental poets. His translation of Omar Khayyám is perhaps his best-known work, and is very highly thought of. He had great powers of language, and treated his originals with much boldness, not however obscuring, but enhancing, if possible, their good qualities.

Fitzgerald, Lord Edward (1763–1798), was brought up in France, and in 1779 entered the English army, and served in America. He then sat for a time in Parliament for Athy. When the French Revolution broke out he went to Paris. In 1793 he returned to Ireland, and in 1796 joined the Society of United Irishmen. He joined in a plot for bringing about a French invasion. The plot was betrayed, and Fitzgerald was seized after a struggle in which he received a wound from the effects of which he died.

Fitzgibbon, John, Earl of Clare (1748–1802), Lord Chancellor in 1789, took a considerable part in the struggle for the Act of Union between England and Ireland. He was exceedingly unpopular with his countrymen, but he seems to have possessed great ability. He upheld the Union, but attacked the Whig absentees.

Fitzherbert, Mrs. (1756–1837), a Roman Catholic lady, who was married in 1785 to the Prince Regent. The marriage was legally invalid, and the Prince denied its having taken place. Upon the Prince's marriage to Caroline in 1795 the pair separated, but came together again later, parting finally in 1806.

Fitzroy, Robert, naval officer, surveyor, and meteorologist, was second son of Lord Charles Fitzroy, and was born in 1805. He entered the navy in 1819, and became commander in 1828, captain in 1834, retired rear-admiral in 1857, and retired vice-admiral in 1863. From 1828 to 1836 he commanded the *Beagle*, in which, during part of the time, Charles Darwin was naturalist. In 1841 he published *A Narrative of a Ten Years' Voyage of Discovery Round the World*, in collaboration with Capt. P. P. King, R.N.; and in the same year was elected M.P. for Durham. From 1843 to 1845 he was Governor of New Zealand. Subsequently, as meteorological statist to the Board of Trade, he elaborated a system of barometrical theories and storm-signals, now almost universally adopted; but after he had published his *Weather Book* his reason gave way, owing to overwork, and in 1865 he committed suicide.

Fitzwilliam, William, Earl (1748–1833), took his seat in the House of Lords in 1769, and acted in opposition to Pitt, but afterwards gave into his views, and was made by him Lord-Lieutenant of Ireland. His views upon Catholic Emancipation were too advanced for Pitt, who recalled him, and his recall was followed by the rebellion of 1798. The Earl did not again take any very active part in politics, though the Whig party did not entirely lose his services.

Fiume, a free town, and port of Hungary, on the Recina, at the N. of the Gulf of Quarnero, 46 miles S.E. of Trieste. There is an old town situated upon a hill, and a new town lying along the shore. There are two railways, and two harbours, which have been greatly improved so as to admit vessels of considerable size. Among the buildings are a cathedral, a good church, a theatre, barracks, and several schools, and in the old town is an arch said to date from Claudius II. Several foreign consuls reside in the town. The chief exports are paper, wheat, wine, tobacco, timber, salt, and hemp. There are a Whitehead's torpedo factory, Smith and Meynie's paper-mill, tobacco factories, chemical works, a steam flour-mill, and ship-building, tanning, and rope-making are carried on, and there is a trade in tunnies with Trieste and Venice. The neighbourhood is stony, the climate warm, and good wine is produced.

Five Mile Act, an Act passed in 1665, which forbade ministers to teach in schools, or reside within five miles of a corporate town, unless they took the oath of non-resistance, and subscribed the Act of Uniformity.

Fives, a game carried on by one player or several players arranged in sides. It consists in striking a ball with the open hand against a wall, either on its first return from the wall after it has been struck by an opponent, or before a second rebound from the floor of the court. The ball must not touch the wall below a certain height, or rebound more than a certain distance, the regulations in this respect differing with local usage. The game takes its name from the five fingers of the hand: it was common in France and England in the 14th and 15th centuries, under the title of "palm-play" or *jeu de paume* (now used of tennis), and is forbidden in a statute of Edward III., as interfering with due exercise in archery. It now survives only in the public schools and universities.

Fixed Air, the name given by Black to carbon dioxide, CO_2, owing to its existing in compounds in combination with magnesia, lime, and caustic alkalis, etc., or being, as he termed it, "held fixed" by these substances.

Fixed Bodies are those which remain unaltered and do not volatilise upon heating. Fixed Oils, similarly, are those which do not volatilise at temperatures below that required for their decomposition.

Fixed Proportions, Law of. [Atomic Theory.]

Fixed Stars. True stars are generally called *fixed* to distinguish them from the *planets* or "wanderers," whose motions are so much more obvious. Nevertheless, though the motions of stars are apparently slight, observations extending over sufficiently long periods, and made with sufficiently accurate instruments, show that they are really moving with speeds comparable to that of the earth in its orbit. [Stars.]

Fixing, in *Photography*, is the term applied to the operation of rendering permanent the image

formed on a "negative" or positive print [PHOTOGRAPHY], by dissolving away the unacted upon and unchanged sensitive constituents. It is of course necessary that the solution used for this purpose should not act upon the deposit which forms the image itself. In those cases where salts of silver, as the chloride, bromide, or iodide, are the sensitive substances employed, as in ordinary silver prints, negatives, or bromide papers, sodium thiosulphate ($Na_2S_2O_3$), known commercially and generally as sodium hyposulphite, is almost invariably employed. Where iron salts are used, as in the platinotype and chrysotype processes, dilute hydrochloric acid is used, while in the carbon process the print is fixed during development, as the latter consists in washing away all the unaltered parts.

Fixtures, as the name indicates, are things of an accessory character annexed to houses or lands, and in that sense they include not only such matters as grates in a house, or steam engines in a colliery, which follow in some respects the law of personal chattels, but such things also as windows and palings, which are for every purpose parcel of the realty. To be a fixture, however, the thing must not constitute a part of the soil or principal subject matter itself—*e.g.* the walls or floors of a house, being an intrinsic part of the house, are never described as fixtures—and, on the other hand, the fixtures must be in some union or connection (actual or constructive) with the principal subject matter, and not merely brought into contact with it, as in the case of a picture suspended on hooks against a wall or a wooden barn resting by its weight alone upon a brick foundation.

As to annexations made by a tenant during his term, the general rule is that he can never again sever them without the landlord's consent; the property by being annexed to the land belongs to the freeholder, and a tenant by making it a part of the freehold is considered to have given up all future right to it, so that it would be waste in him to remove it afterwards. But a tenant may so construct the erections that they shall not be deemed fixtures: thus, if he erect even buildings, as barns, granaries, sheds, and mills upon blocks, rollers, pattens, pillars or plates, resting on brickwork they may be removed, for, unless they be affixed to the freehold by being let into it, or are sure by means of nails, mortar, or the like united to it, they remain movable chattels only. The exceptions to this rule are three:—

1. *In favour of trade.* A tenant may remove such things as he has fixed to the freehold for purposes of trade or manufacture, if the removal causes no material injury to the estate.

2. *For agricultural purposes.* The Agricultural Holdings Act, 1883, gives a tenant a property in any engine, machinery, fencing, or building for which he cannot get compensation, affixed after January 1st, 1884, so that it is removable by the tenant before or within a reasonable time after the termination of the tenancy, subject, however, to the tenant paying any rent due, etc., avoiding or making good damage, giving the landlord notice before removal and allowing him an option of purchase.

3. *For ornament and convenience.* The following are removable:—Hangings, tapestry, and pier glasses, whether nailed to the walls or panels or put up in lieu of panels, marble or other ornamental chimney pieces, marble slabs, window blinds, wainscot fixed to the walls by screws, grates, ranges, and stoves, although fixed in brickwork, iron backs to chimneys, beds fastened to the walls or ceiling, fixed tables, furnaces, and coppers, washtubs, and fixed water-tubs, coffee and malt mills, cupboards fixed with holdfasts, clock cases, iron ovens and the like, provided the separation occasions but little or no damage. The fixtures must be moved before the tenant's term or interest expires, unless in the case of a strict tenancy at will, when the tenant may be allowed a reasonable time after his tenancy, if his interest were not terminated by his own act.

As between the heir and the personal representative, the fixtures will generally pass with the freehold to the heir, but such of them as have been put up for ornament, domestic use or trade, devolve to the personal representative, provided they can be easily removed and are not essential to the enjoyment of the inheritance.

Fjord, a long, narrow, and often very deep inlet of the sea on the west coast of Norway. Fjords are the seaward prolongations of mountain valleys, so that their depth is merely a measure of the depression of the coast. The sea lochs of Scotland, such as Loch Nevis and Loch Fyne, the loughs of Ireland, such as Lough Foyle, Lough Swilly, Bantry Bay and Dunmanus Bay, numerous similar indentations on the north-west coast of America, and such inland depressed and submerged glens as the Lake of Lucerne and Lago Maggiore, are examples of the same thing, though known by so many distinct names.

Flaccus, CAIUS VALERIUS, of the 1st century A.D., a Latin poet of whom next to nothing is known, save that he wrote a mediocre work called *Argonautica*, an account of Jason's expedition in search of the golden fleece. He may have been a friend of Martial, and alluded to in one of Martial's epigrams, but this is not certain. He is thought to have died before 90 A.D.

Flacius, MATTHIAS (1525–1575), a German theologian, was educated at Basel, Tübingen, and Wittenberg. In religious difficulties he consulted Martin Luther, and became professor of Old Testament at Wittenberg. In 1557 he was professor at Jena, but his independence of view kept him in constant trouble. He was driven out for holding Manichæan views, and wandered to Ratisbon, Antwerp, Strasburg, and Frankfort-on-Main where he died. He had considerable reputation as a Scriptural interpreter.

Flag. [IRIS.]

Flag, any banner or ensign used, or intended to be used, to convey a definite meaning, as, for example, nationality, ownership, or any signal.

Flags may be divided into national, including naval and mercantile, ensigns: flags indicative of rank or office; house flags; and signal flags; and while, strictly speaking, the word flag means a right-angled parallelogram of bunting or other suitable material, the term is also used generally to cover pennants, burgees, and, in fact, all forms of bunting employed for display. National flags, or ensigns, are ordinarily half again as long as they are broad. That part of them which is placed next to the mast or halliard is known as the "hoist," the free end as the "fly." As the proportions of the British flag differ from those of most other nations, and as, moreover, the flag itself is, more often than not, wrongly constructed, a few words concerning its form and history are not inappropriate. The essential feature in every British national flag is the "Union," which either occupies the whole field (when it forms the "Union Jack"), or is confined to the upper corner of it, next the flagstaff (when it forms the white, blue, or red ensign, as the case may be). This Union should be twice as long as it is broad. If, therefore, the breadth of the hoist be represented by 100, the length will be represented by 200. The proper width of the Red St. George's Cross is 20; that of each white border of the St. George's Cross, 6·66; that of the white St. Andrew's Cross, 10; that of the red saltire, standing for Ireland, 6·66; and that of the white fimbriation of the red saltire, 3·33. The St. George's Cross represents England. According to some, its white edging is merely a heraldic fimbriation; while according to others it represents the remains of an old French flag (a white cross on a blue field), which was utilised by England in the early days of the claim of the English kings to the crown of France. The compound diagonal cross represents not only two crosses—viz. the Irish saltire gules and the white Scots cross of St. Andrew—but also the heraldic fimbriation proper to the former when borne upon a field azure; and therefore the whole is arranged, so as to indicate its significance, in an "interchanged" manner; or, in other words, Ireland and Scotland are each given predominance in alternate limbs of the main diagonal cross. Before the union with Scotland the St. George's Cross stood alone on the English flag; subsequently the crosses of St. George and St. Andrew were blended, and in 1801 the present "Union" was adopted upon the admission of Ireland. Used alone, and covering the whole field of a flag, the Union Jack is employed extensively by the army; and by the navy is borne in every ship on the jack-staff, or forward flagstaff, as a kind of subsidiary ensign; while, hoisted at the main, it is also the badge of an admiral of the fleet. Used as forming the upper near canton of a flag, the Union is employed in three ways: firstly, in the White Ensign—a white flag which bears over its whole field a red St. George's Cross, two-fifteenths of the width of the ensign, and which is carried on the flagstaff or at the peak of every British warship in commission, and also, by licence of the Admiralty, by the vessels of the Royal Yacht Squadron; secondly, in the Blue Ensign, a flag which has a blue field, and which is carried by vessels officered and manned up to a certain strength by the Royal Naval Reserve, by certain vessels chartered by Government, and by certain licensed yacht clubs; and thirdly, in the Red Ensign, a flag which has a red field, and which is the flag of the mercantile marine generally, and of ordinary yacht clubs and private craft. The Union also appears bordered in the merchant service and in some signal flags. Among British flags indicative of rank or office may be mentioned the Royal Standard; the Admiralty flag (a gold foul anchor on a red field); the Trinity House flag (a St. George's flag, with ships in full sail in the cantons); and the distinguishing flags and pennants of naval officers of various ranks. Among house-flags are the numerous distinguishing flags of the various steamship companies and yacht clubs. Among signal flags may be reckoned not only those arbitrarily arranged flags, burgees, and pennants by means of which ships at sea communicate one with another; but also national and other flags, when used, as they often are, to convey significations other than those for which they are primarily intended. Thus, any British ensign hoisted with the "Union" down is indicative of distress. The St. George's Cross on a white field began to be used as the regular English naval ensign as early as the 14th century. At the union of 1606 the ensign became "azure, a saltire argent, surmounted by a cross gules fimbriated of the second," the fimbriation being one-third the width of the red cross, and the red cross one-fifth the width of the flag; and this remained the national ensign, except during the Cromwellian period, until 1801. In that period ensigns varied a good deal, and sometimes had a harp on the fly; but the old Union was reintroduced in 1660.

Flagellants (from Latin *flagellum*, a whip), a sect of fanatics who arose in the Middle Ages, and sought by their self-inflicted castigations to atone for the impiety of the age. Their custom was to march in procession from town to town, in garments of sackcloth with the back and shoulders left bare, carrying crucifixes in their hands or wearing the image of the cross woven on their caps. On arriving at a town they resorted to the market-place, where they prostrated themselves on the ground in the form of a cross, while each in turn lashed the others with a knotted scourge until the blood flowed. Meanwhile they never ceased their wild hymns, in which they denounced the wickedness of men and sought the forgiveness of Heaven. Each member pursued this course for 33 days—the number of the years during which Christ lived on earth. They first appeared at Perugia in Italy in 1260, whence they spread into many parts of Austria, Germany, the Netherlands, and France. As the movement extended, they adopted the most heretical tenets, rejecting the sacraments, and maintaining that the blood shed by them was as effectual as that of the Saviour in the remission of sin. On the outbreak of the Black Death the enthusiasm of the sect greatly increased, especially in Germany. In 1349 they made their appearance in England, but they never gained any firm hold in this country. A bull was issued against them by

Clement VI., and we hear little more of them till 1414, when the *Flegler* arose in Saxony under the leadership of Conrad Schmidt. This outburst was even more extravagant than the preceding one; Schmidt claimed to be divinely inspired, and denied the authority of the Church, but he and his comrades were seized and burnt. The doctrines of the Flagellants were condemned in the Council of Constance, and soon afterwards they disappear completely from history.

Flagellata, a group of Infusoria (q.v.) belonging to the division Mastigophora (q.v.), and including those forms which swim by the action of one or more flagellas. A flagellum is a whip-like filament which can be lashed backward and forward by the animal. The two best-known members of the group are *Noctiluca*, which is the principal cause of the phosphorescence of the sea, and *Euglena*, which often occurs in such abundance in stagnant pools as to colour the water green. The members of the group are all microscopic in size.

Flageolet, a wind instrument which has taken the place of the ancient flute. It consists of a mouthpiece and a tube containing six finger-holes. Its compass is a little more than two octaves upward from G on the treble stave. The tin whistle is a kind of flageolet.

Flag-Lieutenant, in the navy, a species of aide-de-camp to an admiral. He is a lieutenant, chosen for the position by the admiral, with whom he lives and messes. He is distinguished by wearing aiguillettes. A flag-officer is an admiral. A flag-captain is the captain of a ship that bears an admiral's flag.

Flagstone, a rock belonging to Lower Silurian series, so laminated that it naturally splits into thin layers or flags suitable for paving. This is a characteristic of certain sandstones, limestones, and indurated clays. Among the best known are those in Caithness and at Festiniog in North Wales. In common language a "flagstone" is any flat stone used for paving.

Flahault de la Billarderie, Auguste Charles Joseph, Comte de (1785–1870), a French general and diplomatist, born in Paris. His father, a marshal, was guillotined in 1793. The boy went to England with his mother, but returned later to France, and took part in the Italian campaign, becoming eventually *aide-de-camp* to Napoleon. He rapidly advanced, but in 1825 he was exiled. In 1830 he returned to France, and was made a peer, and received the Grand Cross of the Legion of Honour, and was made ambassador to Berlin and Vienna. Under Napoleon III. he was made a senator, Chancellor of the Legion of Honour, and ambassador to England.

Flake White, a white substance which consists of a basic nitrate of bismuth formed by the addition of water to a solution of nitrate of bismuth, $Bi(NO_3)_3$. Its composition may be written as $BiNO_3(OH)_2$, but is subject to variation. It is used occasionally in medicine, as a pigment, as a glaze for porcelain, and under various names as "blanc d' espagne," "blanc de fard," etc., is employed as a cosmetic.

Flamborough Head, a cape on the E. coast of Yorkshire, forming a bold headland pointing S.E., and enclosing Bridlington Bay. It is a chalk formation six miles long, and its cliffs which are in places 300 feet high, and have large caverns at the base, are the resort of innumerable sea-fowl. The lighthouse at the extreme point has a revolving light 214 feet above sea-level, and visible 30 miles off.

Flamboyant, the style of Gothic architecture which succeeded the Decorated in France, corresponding in date to the Perpendicular in England. The name is derived from *flambeau*, a torch, and is due to the waving character of the tracery in windows, panels, etc., which produces an effect like that of tongues of flame. Flamboyant architecture is in the main merely a corrupt form of Decorated, and its leading characteristic is the intricacy and superabundance of the ornamentation. The mouldings are very inferior to those of earlier styles: undue prominence is given to the large empty hollows, while the fillet is sparingly used; and the mouldings often run into one another without any dividing line, or are separated only by an arris. The pillars, which are commonly circular, usually lack capitals, and are often entirely bare; at other times the chief mouldings of the arches, instead of ceasing abruptly, are continued down the surface of the pillars. When suites of mouldings meet, they are often made to interlace, in a peculiarly intricate fashion. Two-centred arches are the most common, but the semicircle, the ogee, and the ellipse also occur. The canopies are highly finished, and are often very beautiful.

Flame. All flames consist essentially of gases heated to incandescence. In almost all cases the high temperature is due to chemical action, usually that of combination. Thus the flame of substances burning in air is formed owing to the high temperature produced by the combination of the burning substances with the atmospheric oxygen. Sir Humphry Davy was the first to carefully study the nature of ordinary flames such as those produced by a candle, etc. In the burning of a candle the melted tallow or wax, etc., is attracted up the wick, where, owing to the high temperature, it is decomposed into gaseous hydrocarbons, which by their combination with the oxygen produce the high temperature necessary for the maintenance of the flame. As combination only occurs when the gases and the air mix, the flame at the lower part is hollow, the inner portion consisting of the hydrocarbons alone separated from the atmospheric oxygen by the zone of burning gases. The flame may be divided into three portions: (1) a dark central zone surrounding the wick, which consists of unburnt gases; (2) a bright luminous zone in which combination is going on, and in which the hydrocarbons are being further decomposed, but in which the combustion is not complete; (3) an outer zone, non-luminous, or but slightly so, in which the combustion is completed. The luminosity of flame is dependent upon a number of factors—as, *e.g.* (1)

the temperature, (2) the density of the gases, (3) the presence of solid particles. Thus with increase of temperature, other factors being unchanged, the luminosity is increased, and flames but feebly luminous may be rendered highly so by previously heating the constituent gases ; owing to this cause the flames of sulphur, etc., burning in oxygen are far more luminous than when burning in air alone. Increase of density of the gases also causes increase in the luminosity, and substances burning under pressure give in general brighter flames than those of the same substance burning under ordinary conditions. The presence of solid particles in a flame always greatly increases the luminosity, and Davy supposed it was the sole cause, but many flames are highly luminous although they contain no solid particles, as the very brilliant flame caused by the combustion of carbon bisulphide in nitric oxide. In the case of coal-gas or a candle the luminosity appears to be chiefly due to incandescent carbon particles, produced during the destruction of the hydrocarbons. Professor Frankland, however, states that his, as yet unpublished, experiments show these do not constitute "an important source of luminosity." If air be mixed with the gas before burning, as in the Bunsen burner (q.v.), the flame becomes non-luminous, owing to the more complete combustion of the hydrocarbons with less separation of carbon. Admixture with an inactive gas, as nitrogen or carbonic acid, however, also renders the flame non-luminous. In this case the effect appears to be due to the dilution of the gas with hence a lower temperature, and the spreading of the combustible material over a larger area so that it is more readily consumed by the oxygen of the surrounding air. The Bunsen flame is, however, far hotter than the ordinary gas flame, owing to the more complete combustion, and if a jet of air, or better, oxygen, be directed into the flame [BLOWPIPE], a hotter flame still is obtained. If the air is in such quantities that it is insufficient to combine with the gases, the flame contains material which can combine with oxygen, and is hence a *reducing* flame. If, however, the air is in excess, the flame contains heated oxygen, and forms an *oxidising* flame. For the continuance of a flame a certain temperature—*temperature of ignition*—is required, and if the gases be cooled below this the flame ceases. Thus a candle may be extinguished by placing a cold copper spiral around the wick, while a flame will not pass through wire gauze until the gauze is itself heated nearly to redness. Upon this fact is based the well-known Davy lamp, in which the flame is surrounded by metallic gauze. The colour of flames depends on the burning substance, and, to an extent, upon the temperature, but the chief cause of coloration of flames is the presence of foreign substances, as metallic salts, which are introduced into a flame. Thus sodium salts colour a flame yellow, strontium salts, crimson. [FLAME COLORATIONS.]

Flame Colorations, a test employed in qualitative analysis whereby certain metals are recognised by the colour imparted to the flame of a Bunsen burner, or blowpipe, when the substance examined is heated in it. The colorations caused by the chief metals so recognised are as follows : —

Sodium	Yellow.
Potassium	Violet.
Lithium	Carmine.
Strontium	Scarlet.
Calcium	Brick-red.
Barium	Yellowish Green.
Copper	Emerald Green.
Arsenic	Lilac.
Lead	Blue.
Copper Chloride	Azure Blue.

Green flame may also be caused by the presence of borates, phosphates, or molybdates, in the substance.

Flamen, in the religion of ancient Rome, was a priest devoted to the service of some special deity. The most ancient and honoured, known as *Majores*, were those of Jupiter (*Flamines Diales*), Mars, and Quirinus ; they are said to have been instituted by Numa, and were invariably patricians. The twelve other flamens (*Minores*) were chosen from among the plebeians. They were at first elected by the *Comitia Curiata*, but after 104 B.C. they were nominated by the people in the *Comitia Tributa*, and afterwards installed by the *Pontifex Maximus*. On his election a *Flamen Dialis* passed out of the *patria potestas* or control of his father, and he possessed other privileges, such as a seat in the senate, but his liberty was curtailed in many ways. For example, he might not mount a horse or spend a night outside the city.

Flamingo (*Phœnicopterus*), a genus of Anserine birds, with eight species, four of which are American, the others ranging over Africa, the South of Europe, India, and Ceylon. They are often made a family ; and Professor Huxley constituted for them his group Amphimorphæ, on the ground that they were intermediate between the Geese and the Storks and Herons. The neck and legs are very long, and the feet webbed ; the bill is longer than the head, bending downwards in the middle, and furnished on each side with sieve-like plates, to act as strainers, and the tongue is armed with strong recurved spines. These birds fly well, and are good swimmers, but only in deep water, owing to their long legs. When feeding, the neck is bent, so that the head is upside down, for in no other position could they bring the straining plates into play. The food, like that of ducks and geese, consists of worms, molluscs, crustaceans, and small fishes, and is taken by the simple device of filling the mouth with water, which runs out through the comb-like plates of the bill that also serve to retain the prey. The Common Flamingo (*P. antiquorum*) is a summer visitor to the South of Europe. The plumage of the male is white with a pinkish tinge, and the wing-feathers are brilliant scarlet. The neck is extraordinarily lithe, as may be seen by visitors to the Zoological Gardens, or in the life-like sketches of the late Rev. J. G. Wood's Explanatory Index to Waterton's *Wanderings*. The nest is a conical structure of mud, and the balance of evidence seems to be in favour of the view that the hen birds sit with the legs hanging down on each side or stretched out behind.

Flaminian Way (*Via Flaminia*) was made by the Censor C. Flaminius in 220 B.C. It ran northwards from Rome through Narnia and Spoletium and over the Apennines to Fanum Fortunæ on the Adriatic, whence it skirted the coast to Ariminum. It was continued through Cisalpine Gaul under the title of Via Æmilia.

Flamsteed, JOHN (1646–1719), the first English Astronomer Royal, was born at Denby near Derby. He was educated at a free school, and showed great aptitude for mathematics, astronomy, and the making of mathematical instruments. In 1667 he wrote a paper upon the equation of time, and in 1673 he wrote upon the real and apparent distance of planets. Charles II. made him Astronomer Royal, and he observed at the Queen's house at Greenwich till the Observatory was built. His *Atlas Cœlestis* was published in 1753, and he took a great part in preparing material for the *Historia Cœlestis*. In his later years he was involved in a quarrel with Newton and Halley, but opinion has been much divided as to the relative merits of the disputants.

Flanders, or VLAANDEREN, was the name of a district of Western Europe, beginning from the Schelde just below what is now Fort Lillo and extending along the Western Schelde to the entry of the Straits of Dover. It was made a county in the 9th century by Charles the Bold of France for his son, Baldwin, and this name has been traditional for the Counts of Flanders and their descendants or representatives down to the present day, the late heir to the Belgian throne having borne the name. Readers of Norman history will remember the murder of William Longsword by Count Arnulf of Flanders. In later times it belonged to Spain and Austria, and later to Austria alone, till part was taken by France, and formed into what is now known as French Flanders, and part became Dutch and received the name of Zeeland. Besides French Flanders, which is more fitly dealt with under the head of France, there are the two Belgian provinces of East and West Flanders. Of these East Flanders has Holland on the N., the provinces of Antwerp and Brabant on the E., Hainault on the S., and West Flanders on the W. It is 34 miles long by 32 miles wide, and contains 1,157 square miles, being situated in the basin of the Schelde, and having a flat surface of a mixed sandy and clayey formation. The Pays de Waes is now noted for the high degree of cultivation it has been brought into, though till comparatively lately much of it was a sandy swamp, owing to the inundation of the Schelde which was brought about for strategic purposes. Much of the land on each side of the river can be laid under water, if necessary, in the course of a single tide. The land produces much wheat and flax, the latter crop making itself disagreeably apparent to the nostrils of anyone walking through the district bordering on the Schelde in late summer. There are abundance of horses and cattle, and much dairy produce. Wool, cotton, and flax are worked up, and flax, hops, and oil are exported. There is little wood except that planted by the roadsides, and this is chiefly soft wood, such as willow, which is largely employed for sabót-making. There are tanneries, breweries, and distilleries. The principal towns are Ghent, Alost, Termonde, St. Nicholas, and Eccloo. West Flanders has on the N. and N.W. the German Ocean, on the S. and S.W. France, on the S.E. Hainault, on the E. East Flanders, and on the N.E. Holland. It is 54 miles long by 48 miles wide, and contains 1,248 square miles. It is generally flat, but there are some sandy hills, and dunes line the coast. Part of it is in the basin of the Schelde and the Lys, and part in that of the German Ocean, into which several small streams flow, one of the chief being the Yperlee. The soil is naturally poor and sandy, but has been brought into high cultivation. There is also much moorland, and the cattle, poultry, game, and fish are abundant. The chief products are flax, oil seeds, barley, hops, madder, tobacco, and chicory. Excellent linen is manufactured, and a good deal of lace is made. There are also breweries, tanneries, distilleries, and dye, soap, oil, and sugar works. The principal towns are Bruges, Courtrai, Ypres, Dixmude, and Ostend (Oostend). The Flemish language is by no means confined to Flanders, but is spoken throughout North Belgium, most of whose inhabitants are bilingual, and there is a good deal of jealousy between the Walloon and Flemish parts of the country. The Flemish of Antwerp differs in many points from that of Ostend, and it shades off into Dutch as the Dutch frontier is approached.

Flandrin, JEAN HIPPOLYTE (1809–1864), a French painter, was born at Lyons. His father was an artist, who had somehow missed his mark and had devoted himself to miniature-painting. His son, Hippolyte, came to Paris in 1829, and entered the studio of Ingres. In 1832 his gaining the Grand Prix de Rome by his picture *The Recognition of Theseus by his Father* did much towards smoothing his way; and he sent several good pictures home from Rome, one of the most notable of which was *St. Clair Healing the Blind*. He returned to Paris in 1838, and was employed to ornament a chapel in the church of St. Severin. He did much decorative and monumental work, and painted many portraits. In 1863 the state of his health compelled him to return to Italy, and he died in Rome.

Flank (*side*), in fortification, is the part of a bastion which extends from the face to the curtain, commanding and defending the latter as far as the next bastion. The flank of an army is properly the right or left wing, but may be used of any of its divisions. *Flank company* is the company posted on the extreme right or left of a battalion. "To flank" a position is to guard it with field-works; the word is also used of detaching troops for the purpose of defending one's own flank or attacking that of the enemy. *Flanking parties* are cavalry or infantry thrown out to reconnoitre or to protect a column while marching.

Flannel, a woollen material. It is manufactured by first of all scouring and "devilling" the wool, which is then carded, spun, woven, and fulled. The best

British flannels are the Welsh, which are made from the short staple wool of the native mountain sheep. Their manufacture is carried on extensively at Newtown and Llanidloes in Montgomeryshire. Next in quality are the Lancashire flannels, in the making of which the wool of a variety of the Sussex breed is much employed. The chief seat of the Lancashire manufacture is Rochdale. At Barnsley and other places in Yorkshire, blankets are manufactured from wool of coarse staple imported from Mysore in India. Large quantities of flannel are exported from England, especially to Australia and British North America. The industry is now well established in the United States, where the flannels are made of closely twisted yarn, and are less fulled than the English.

Flat. 1. In *Music*, is the sign ♭ which lowers the note to which it is prefixed by one semitone. The double flat ♭♭ lowers the note it precedes by two semitones. 2. In *Building*, a storey or floor of a house, used especially of tenement houses, in which each storey is inhabited by a separate family, all being approached by a common house door and staircase. This method of joint occupation, much in vogue on the Continent and in America, has recently become common in London, both among the well-to-do and the poor.

Flat Fishes (*Pleuronectidæ*), an important family of Anacanthinous food-fishes with thirty-four genera and about 200 species from all seas except those of the highest latitudes. They are most numerous in the tropics, but the largest species are from the temperate zone. The young are symmetrical with the eyes in the normal position, and swim vertically in the open sea. The adult forms are ground fishes, markedly unsymmetrical, having the body greatly compressed from side to side, with the eyes on the upper surface, which may be the right or left, and swimming horizontally with an undulating motion. How the change in the position of the eyes is effected is uncertain. The colour of the upper side assimilates with the ground on which they lie concealed; the under surface is generally colourless. The dorsal and anal fin usually extend the whole length of the body without division. The type-genus Pleuronectes, from the north temperate zone, has 23 species. The most important British flat-fishes are the brill, dab, flounder, plaice, sole, and turbot (all which see).

Flatheads (Salish, Selish), a group of Columbian Indians, whose domain formerly extended from the Cascade Range eastwards to the Rocky Mountains. By some ethnologists they are regarded as a branch of the Athabascan family, while others consider them an independent race speaking various dialects of a stock language. The Flatheads proper—that is, the Têtes-Plats of the early Franco-Canadian *voyageurs*—dwelt originally on the Flathead and Clarke affluents of the Columbia river, but are now mostly settled in the Flathead Agency, Montana. Many of the other members of the group are still known by the names given them by the Canadian pioneers, who had established trading relations with these Indians long before the Anglo-Americans reached the Pacific slope. Such are the Pend' Oreilles, Nez-Percés, and Cœurs d'Alène, though the ethnical and linguistic relations of these and other so-called Flathead tribes are still far from being clearly established. The term Flathead, given to the chief tribe from the practice of manipulating the skull in infancy, is equally and sometimes even more characteristic of all the other Salish tribes, and notably of the Chinooks of the Lower Columbia. Another common trait is the great love of ornaments inserted in the lobes of the ear, in the nostrils and lips. The Flatheads worship the sun, to whom they formerly made offerings of human victims, for which in later times were substituted slices of flesh voluntarily cut from their breasts by the chief's sons or the bravest women of the tribe.

Flatulence, the condition in which the stomach or bowels become unnaturally distended by "*flatus*" or "wind." The evolution of gas is attributable to fermentation processes brought about by diseased conditions of the mucous membrane and abnormal constitution of the digestive juices. [Indigestion.]

Flaubert, Gustave (1821–1880), a French novelist, was born at Rouen. He was the son of a physician, and inherited a small fortune, which enabled him to follow his own inclinations as to his calling in life. After some hesitation he decided upon literature, and at first essayed poetry, but finally fixed upon prose as the most fitting vehicle for expressing his sentiments. It is said that for a time he suffered from some obscure brain disease, which may not have been without its effect in colouring his thoughts and his methods. The novel which made the greatest impression upon his contemporaries was *Madame Bovary*. This displays all the characteristics of his style. A purist in language to a degree that made his writing and revision a formidable labour, he also showed a minuteness of detail and analysis that closely resembles the later "naturalistic" school, though he did not otherwise resemble them in treatment of subject. In *Madame Bovary* he paints a life of adultery in all its naked vulgarity and hideousness, and casts around it none of the glamour that some of his fellow novelists have bestowed upon it. The next most important of his novels is *Salammbô*, a story of ancient Carthage. In 1866 he was made member of the Legion of Honour. In 1862 he produced his *Education Sentimentale*, and in 1874 *Tentation de St. Antoine* and a play called *Le Candidat*. In 1877 he published *Trois Contes*, which appear to some extent to be either a reproduction, or possibly the original form, of the three novels above mentioned. *Bouvard et Péluchet*, another sordid story of middle-class life, appeared after his death. A good edition of his works was published in 1885.

Flavaniline, a derivative of quinoline (pamidophenyl or methyl quinoline) of composition $C_{16}H_{14}N_2$, which, together with its salts, is largely used as a dyestuff, giving a fine, clear yellow colour.

Flavel, John (1627–1691), a Nonconforming minister, was born at Bromsgrove, and was educated

at Bromsgrove grammar school and at University College, Oxford. In 1650 he took orders, and was appointed curate and afterwards vicar of Deptford. In 1656 he went to Dartmouth, but in 1662 his refusal to comply with the Act of Uniformity led to his ejectment. In 1687 he took a post as Nonconformist minister at Dartmouth. His published treatises and sermons fill six volumes.

Flavine, an extract of *quercitron* bark, formerly largely employed as a yellow dyestuff. Its value varied greatly with the manner in which the extract is made. It is usually obtained by boiling the bark with water and then adding sulphuric acid, which precipitates the dyestuff as a yellow powder. Various "mordants" may be employed with it, different colours resulting according to the mordant employed. With aluminium or tin mordants a fine yellow results; iron salts give a grey to black colour; and by the use of mixtures of iron and aluminium salts different shades of orange may be obtained.

Flax, the name of a plant, *Linum usitatissimum*, and of the fibre prepared from it. This annual plant, belonging to the order Linaceæ, seems to be wild in south-west Asia, to have been cultivated for 4,000 or 5,000 years in Assyria and Egypt, and to have been introduced into northern Europe by the Finns (Turanians), and farther south by the western Aryans. Previous to the coming of the latter race the closely allied perennial flax (*L. angustifolium*) was cultivated by the lake-dwellers of Switzerland and North Italy in the Stone Age, by whom its fibre was used for fishing-lines and nets. The fine linen of Egypt is on record from the time of Joseph (Genesis xli. 42). As cultivated, flax is an erect plant 20 to 40 inches high, with small, scattered, sessile, linear-lanceolate leaves and a corymbose inflorescence of bright blue flowers. The five caducous petals are three times as long as the pointed ciliate sepals; and the round capsular fruit or "boll" formed by five united carpels, though five-chambered, is partially divided by ingrowing midribs or dorsal dissepiments into ten one-seeded divisions. The seeds, which, owing to their mucilaginous testa and oily embryo, are, under the name of linseed (q.v.), scarcely less valuable than the fibre, are flat, oval, and shining, generally dark-brown, but sometimes lighter or redder. Among Western nations flax had no rival as a vegetable fibre until the rapid rise of cotton in the commerce of the end of the 18th century. Four-sevenths of the entire acreage now under cultivation for flax is in Russia, mainly in the north, and it produces fully one-half of the entire flax product of the world. There are about 116,000 acres under flax in Ireland, and the annual home production of the United Kingdom is about 25,000 tons. Besides this we import about 100,000 tons annually, 75 per cent. from Russia, 15 per cent. from Belgium, and some from Holland and Germany. The flax of Courtrai in Belgium is, owing to its fineness, strength, and colour, the most valuable in the market. The preparation of flax consists in (1) *pulling*, the crop being never mown; (2) *rippling*, or combing off the valuable seed-vessels; (3) *retting* or *rotting*, either by *steeping*, *watering*, or *water-retting*, *i.e.* by soaking in pure soft water until by a fermentative decay the bast-fibre is separated from the woody axis or "shive," or by *dew-retting*, *i.e.* spreading the pulled flax on grass for the same change to take place more slowly; (4) *grassing*, or bleaching; (5) *breaking* and *scutching*, or separating the shive, and (6) *heckling* or combing the fibres into parallel order fit for spinning. Hot water, at a temperature of from 75° to 95° F., is sometimes employed for a more rapid retting. The coarser broken fibres removed in scutching are termed "codilla," the finer refuse from heckling is "tow." New Zealand flax is the valuable fibre obtained from the sword-shaped leaves of *Phormium tenax*, an arborescent liliaceous plant introduced in 1822 and planted unsuccessfully in Ireland but successfully in the Orkneys. The demand for this fibre, now classed commercially as hemp (q.v.), exceeds the supply, and it sells at £17 to £22 per ton for rope-making, the refuse being used as a paper material. [LINEN, LINSEED.]

Flaxman, JOHN (1755–1826), an English sculptor, was born at York. His father was a seller of plaster figures, and the lad, his son, used to copy the casts in clay. Showing a decided talent in this direction, he was sent in 1770 as a student to the Royal Academy, and in 1787 he began a seven years' residence in Italy, where he illustrated Homer (published in London, 1805), Dante (published 1806), and Æschylus. He copied much from Greek vases, but while he hit off to perfection the Greek classic style he was able to give life and originality to his works. In 1794 he returned to England, became A.R.A. in 1797, and R.A. in 1800. In 1810 he was appointed professor of sculpture to the Royal Academy, and his *Lectures* were published in 1829. His works are numerous, and many of them well-known. Among them are a monument to Lord Mansfield in Westminster Abbey, a relief of the poet Collins at Chichester, a statue of Lord Howe at St. Paul's, a statue of Sir Joshua Reynolds, and many other statues and groups.

Fleas, an order of insects once included as a subdivision of the Flies or Diptera, but now separated as the order Aphaniptera. The main characters which distinguish the Fleas from the Flies are that the wings are either absent or are rudimentary, occurring only as scales, and that locomotion is effected by jumping. The typical family is that of the *Pulicidæ*, including the Common Flea (*Pulex irritans*). The American Sand Flea (*Sarcopsylla penetrans*) bores into the sole of the foot, and there expands considerably by the growth of the eggs. This is the most serious pest belonging to the order

Flecknoe, RICHARD, was an English poet and dramatist, the contemporary of Dryden, who sharply satirised him in *Mac Flecknoe* in 1682. This was unkind, for Flecknoe spoke well of Dryden. Not much is known of his life, except that he visited the Netherlands, was at Rome in 1654, when Andrew Marvell visited him, and that he went to Portugal, Brazil, and Constantinople, and died

about 1678. He wrote much, but published little, and his poetry was not of a high order.

Fleet. 1. The name of a brook flowing into the Thames on the N. bank, now a covered sewer, but formerly an open watercourse. Its name has been fancifully derived from the supposed quickness of its current; but, seeing that *vliet* is a Flemish word meaning ditch or watercourse, and that there are many *vliets* in the neighbourhood of Antwerp, it seems likely that the Fleet has exactly the meaning of ditch. The tautology of "Fleet Ditch" is akin to that of "Axholme Island," which means "Island island island." The Fleet Prison has played a great part in fiction. There was a prison here on the east side of Farringdon Street in the 12th century. It was burnt down by the Gordon rioters in 1780, and afterwards rebuilt, and finally abolished in 1845. The Fleet marriages of the 17th and 18th centuries became so great a trouble that they were abolished by Act of Parliament in 1754. The noted old law book, *Fleta*, is said to have been written by one confined in the Fleet Prison.

2. A number of warships, operating together or in unison, under a single commander-in-chief A fleet is a larger body than a squadron, and includes, as a minimum, six battleships, with cruisers, etc., in proportion. Fleets are divided into divisions and also into subdivisions, each of which may have a flag-officer in command. The ancient division of a fleet was into three squadrons, the red, the white, and the blue, the squadrons being split up into divisions. "Fleet," as a prefix indicative of rank, is applied in the British navy to those engineers immediately above staff-engineers; to those surgeons immediately above staff-surgeons; and to those paymasters immediately above staff-paymasters. A "master of the fleet" is an officer occasionally appointed to superintend the general navigation, anchoring, or weighing of a large fleet. A "captain of the fleet," or "first captain," is an officer, either rear-admiral or captain, occasionally appointed to act as chief of staff to a commander-in-chief. To "fleet" a tackle is to overhaul it so as to bring into action such mechanical force as may be intended to be employed.

Flegel, Eduard Robert (1855–1886), a German explorer, was born of German parents at Wilna, in Russia. He formed the idea of winning the trade in the Niger district for Germany, and he ascended the river in 1879 and 1880, and in 1883 he discovered the sources of the Benue. He then visited Europe, and returned to Africa in 1886 with a commission to explore the country between the Cameroons and the sources of the Benue, and intended to go to the Congo, but was stopped by death.

Fleischer, Heinrich Leberecht (1801-1888), a German Orientalist, was born at Schandau in Saxony. He studied theology and Oriental languages at Leipzig, and in 1828 and the following years was employed to catalogue the Oriental MSS. in the royal library at Dresden. In 1836 he became Professor of Oriental Languages at Leipzig, and he edited many books and MSS., among them being *Historia Moslemica*, *The Thousand and One Nights*, and a *Commentary on the Koran*.

Fleming, John, D.D. (1785–1857), a British naturalist, was born near Linlithgow, and was ordained pastor to Bressay in Zetland. His *Report on the Economical Mineralogy of Orkney and Zetland* attracted much notice, as did in 1822 his *Philosophy of Zoology*, and in 1828 *British Animals*. In 1834 he was appointed Professor of Natural Philosophy in King's College, Aberdeen, and in 1845 to a chair of Natural Science at Edinburgh. He wrote zoological articles for the *Encyclopædia Britannica* and other works.

Flensborg, a Prussian town of Schleswig-Holstein, and one of the most important towns of the district. It is situated on a fjord of the same name, about 20 miles N.E. of Schleswig. It possesses tobacco, soap, and rice manufactures, foundries, breweries, distilleries, and sugar refineries, palm-oil mills, and steam bakeries; and it has a considerable West Indian trade. The town, with the rest of the duchy, became Prussian in 1866.

Fletcher, Andrew (1653–1716), a notable Scottish politician, was the son of Sir Robert Fletcher, of Saltoun. After much foreign travel he returned to Scotland, and represented Midlothian in the Scottish Parliament. Owing to his opposition to the Court party he found it advisable to leave the country, and went to Holland, and was outlawed on his refusal to appear before the Council. In the reign of James II. he returned under the Act of Indulgence, of which, however, he disapproved on principle as being granted by the king's own prerogative and not by Parliament. In 1683 he was in England, joining in measures against James II., and in 1685 he took part in Monmouth's rising, but, luckily perhaps for himself, was dismissed in consequence of killing another of the Duke's adherents in a duel. He then went to Spain, and afterwards to Hungary, where he fought against the Turks. He then went again to the Netherlands, and in 1688 came over with William III., and got back his forfeited estates, and was a member of the Convention for settling the affairs of Scotland. In Queen Anne's reign he was active against the exercise of the royal prerogative and in measures for settling the demise of the Crown, and he was a strong opponent of the Union of England and Scotland. He wrote, in 1696, a *Discourse on Militias*, in which he advocated universal military training; and he left two discourses on the affairs of Scotland. He was author, too, of a proposal that beggars should be made slaves, under the name of servants, and should be alienable.

Fletcher, Giles (1588–1623), son of a Giles Fletcher who was also a poet and sometime ambassador to Russia, was born in London, and educated at Westminster and at Trinity College, Cambridge. He was afterwards rector of Aldington in Suffolk, and is spoken of by a contemporary as being thrown away upon his boorish parishioners. His chief work, *Christ's Victory*, was published in 1610, and written while he was at Trinity. He wrote also a prose tract, *Reward of the Faithfull, etc.*

Fletcher, John. [Beaumont and Fletcher.]

Fletcher, PHINEAS, brother of Giles, but whether older or younger is unknown (*c.* 1582–*c.* 1650), was an English poet, chiefly known by his *Purple Island* and his *Piscatory Eclogues*. The former is a description of man after the style of Spenser, and founded upon a part of the *Faëry Queen*. Some of it is rather anatomy than poetry, but in the part that describes the mental composition of man are many fine passages and much bold imagery. The *Piscatory Eclogues* also have much merit. Milton is said to have borrowed some ideas from Fletcher.

Fleur-de-lis, formerly the national emblem of France. The word means "flower of the lily," and the three tufts united by a band have as much resemblance to lilies as to anything else. Some, however, suppose the iris to be intended—an explanation which is perhaps favoured by the occurrence of the English "flower-de-luce" as the name of a kind of flag. Others see in the fleur-de-lis the head of an ancient spear called *francisque*. The English used to see a resemblance to a frog, whence the connection of frogs with Frenchmen. But it is now known to have existed as an emblem of royalty or nobility among various nations at different epochs, and ornaments of this kind are said to have been found carved on the sphinxes. The usual form of the French device is three fleur-de-lis on a single coat.

Fleury, ANDRÉ HERCULE DE (1653–1743), a French cardinal and prime minister, was born in Languedoc, and was educated at the Jesuit College of Clermont. He then went to Paris to study philosophy, and such was his progress that he became successively a canon of Montpellier, a doctor of the Sorbonne, and almoner to the queen and then to the king. Louis XIV. made him Bishop of Fréjus and tutor of the prince afterwards Louis XV. After the death of the king he managed to retain the favour of the regent, and in 1726 he became chief minister, and was made cardinal. He piloted France safely through a war with Germany, which resulted in the acquisition of Lorraine by France. A later war, which he did not live through, was unsuccessful.

Fleury, CLAUDE (1630–1723), a French man of letters, was born at Paris, and educated at the Jesuit College at Clermont. He became a lawyer, but abandoned the law for the Church. In 1672 he was appointed tutor to the princes of Conti, and later became the tutor of an illegitimate son of Louis XIV., and was appointed to aid Fénélon in the education of the young Duke of Burgundy. [FÉNÉLON.] He was made abbot of a Cistercian convent at Loc-Dieu, and afterwards prior of the convent of Argenteuil. He became a member of the Academy in 1696, and, owing to the moderate attitude which he adopted in the ecclesiastical controversy of the time, he was appointed confessor to Louis XV. He wrote a good deal, among his works being an *Histoire du Droit Français*, *Mœurs des Israélites*, *Mœurs des Chrétiens*, and *Histoire Ecclésiastique*.

Flies. [DIPTERA.]

Flinders, MATTHEW, naval officer and navigator, was born in 1774 at Donington, Lincolnshire, entered the navy in 1790, and fought in the *Bellerophon* on the Glorious First of June, 1794. In 1795, with some of the ship's company of the *Reliance*, he left Port Jackson, and explored the whole coast to the southward, discovering Bass Strait. In 1797 he was made a lieutenant. In 1801 he obtained command of a larger expedition to explore the coasts of Australia in the *Investigator*. He executed the work most successfully, but on his return was captured by the French, and was for six years their prisoner. In 1810, upon regaining England, he was most deservedly made a post-captain. Four years later he published *A Voyage to Terra Australis*, and in the same year he died.

Flint (or FLINTSHIRE). 1. A maritime county of North Wales, consisting of two parts, one having the Dee on the E., the Irish Sea on the N., and Denbigh on the S. and W.; the other, separated by Denbigh and lying 6 miles to the S.E., has Cheshire on the N.E. and Shropshire on the other sides. It is the smallest of the Welsh counties, but is very populous. The larger part is 27 miles long by 8 miles in width, and the smaller 8 miles long by 5 miles wide; and the two together contain 169,162 acres. A range of not very high hills crosses the county from S.W. to N.E. There are fertile and well-watered valleys, and part of the Clwyd is in the county. The coast is low, and there are very wide stretches of sand, the tide going out a great way, and returning with a rapidity that makes the sands dangerous to strangers. Wheat and oats are the chief crops. There is a breed of small cattle that give excellent milk, and there is much dairy produce. The lead of the county is considered the best in the kingdom, and coal, copper, and manganese are also worked. Holywell and Mold are the chief smelting places. There are 14 miles of works, and ship-building yards along the coast. The county returns one member to Parliament. The Chester and Holyhead Railway passes through the county, following the coast.

2. A parliamentary and municipal borough, market-town, and seaport of Flintshire, North Wales, lying to the S.W. of the estuary of the Dee, 13 miles S.W. of Liverpool. It is built mostly of brick, and is at the foot of a hill. There are a modern Gothic church, a guildhall, several chapels, a prison, and a library. There are large alkali works, and lead and coal mines in the neighbourhood, and much copper. The port has little shipping. The old castle—now in ruins—was built by Edward I., and became the prison of his grandson, Richard II. The town joins with others to send one member to Parliament. There is a station here on the Chester and Holyhead Railway.

Flint, a form of silica (SiO_2), almost pure, occurring in thin beds ("tabular flint"), or more commonly in layers of irregularly-shaped nodules or "flints," in the Upper and Middle Chalk. The phthanites of the Carboniferous limestones, and the cherts of the Purbeck and other beds, closely resemble flint; but are seldom as pure and have generally a splintery fracture instead of the shell-like or "conchoidal" mode of breaking characteristic of true flint. Flint consists of a mixture

of crystalline and insoluble with non-crystalline and soluble silica: the exterior of the nodules is generally less dense and white; the interior horn-like, grey or black and homogeneous, or sometimes banded like an agate; and the centre often hollow and lined with minute crystals of quartz. They frequently have fossils of various kinds imbedded in them, sea-urchins, brachiopods, bivalves, etc., and may have their form entirely determined by branching sponges now represented by a mass of chalk in their central cavity. The microscope also reveals numerous spicules of sponges throughout the flint. No theory of flint formation is altogether satisfactory; but apparently the silica was removed in the first instance from sea-water by the action of living sponges and other organisms, and has subsequently been to some extent aggregated by a purely chemical process of concretion and replacement. It is noticeable that there is less diffused silica in the chalk nearest to the nodules, and that tabular flint occurs in vertical joints (q.v.) as well as along the horizontal beds of the chalk. These facts show aggregation subsequent to the deposition of the chalk. Flints are used for building, are broken up for road-metal, and are powdered and calcined for the manufacture of glass and pottery. In prehistoric times they formed the main material of all weapons and implements over most of Europe, knives, axes, hammers, hide-scrapers, and light-strikers. The earliest human period or Stone Age is subdivided into two, the Palæolithic and Neolithic, distinguished by the flints being merely chipped or being also polished. Though no longer used with iron-pyrites (q.v.), and but seldom with steel, for striking a light, large numbers of flints are still chipped or "knapped" into gun-flints in Suffolk for use by African tribes, who prefer them to percussion caps.

Flint Glass. [Glass.]

Flint Implements, a comprehensive term for the tools and weapons of primitive man, fashioned from flint, before the knowledge of metals. In some cases, however, the use of such implements lingered on as a ceremonial observance, notably for circumcision among the Semites (Exod. iv. 25; Josh. v. 2, margin), for embalming among the Egyptians (Herod. ii. 86), and for the emasculation of the priests of Cybele among the Romans (Catullus, *Carm.* lxiii.; Ovid, *Fasti* iv. 223–296). The list might be greatly extended, and implements similar to those of our remote ancestors are in common use among many tribes of low culture at the present day. Dr. Tylor distinguishes these implements, according as they are merely chipped or ground and polished after chipping as belonging respectively to the Unground or Ground Stone Age—indefinite periods to which Sir John Lubbock has applied the epithets Palæolithic (with Archæolithic as an alternative, but this never came into general use) and Neolithic. The former are generally found in river drifts and caves, and associated with the remains of extinct animals, as the mammoth and woolly rhinoceros, or of the hyena, no longer found in Europe. The latter are met with in surface soil, burial mounds, and lake dwellings, often with the bones of the ox and other domestic animals. Palæolithic implements are generalised—that is, they may serve for many purposes, and are of three fairly distinct types: (1) oval, with sharp edges; (2) long and pointed; and (3) tongue-shaped; while the later ones show distinct specialisation, and the uses of most of them are apparent at once. For these a variety of epithets have been employed by various authorities chiefly with reference to their shape. There was a great find at Kent's Hole, near Torquay, in 1834; then came the discoveries of Boucher de Perthes of Abbeville, of Dr. Rigollot in the drift of St. Acheul, near Amiens, and the visits of English geologists and anthropologists to the valley of the Somme in 1858 and 1859. Since then the investigations that have been carried on have resulted in the discovery of a vast number of these implements, and there is scarcely a museum in the country that has not specimens, very often found in the neighbourhood. There was a prehistoric manufactory of flint implements near Brandon, in Suffolk, and the making of gun-flints is still the chief industry of the town.

Flodden, a village in Northumberland, 5 miles S.E. of Coldstream, chiefly notable as having been the scene of the noted battle in 1513, when the Earl of Surrey completely destroyed James IV. of Scotland and his army. Scott in *Marmion*, Aytoun in his *Edinburgh after Flodden*, and Lady Lindsay's *Flowers of the Forest* have commemorated the battle.

Flogging. [Whipping.]

Flood, Henry (1732–1791), an Irish politician, was educated at Trinity College, Dublin, and at Christ Church. In 1759 he was returned to the Irish Parliament for Kilkenny, and in 1761 for Callan. He was leader of the popular party, and distinguished himself as an orator and duellist. From 1775 to 1781 he was Vice-Treasurer of Ireland. He considered Grattan much too mild a politician. In 1783 he represented Winchester in the English Parliament, and Seaford in 1785, but he did not make much mark in the English House. His Life and Correspondence have been published.

Floor Cloth. All the materials used for covering floors are now included under this title, the most important being the old-fashioned oil-cloth and the newly-invented linoleum. *Oil-cloth*, in the course of its manufacture, goes through the following processes:—Coarse canvas made of jute or flax-tow is woven in large pieces; these are then cut into smaller sections, and one of them—perhaps 25 yards long and 8 yards wide—is placed on an upright frame and stretched by means of screws. It is then "primed" with size, and, when dry, scoured with pumice, after which it is ready for painting, as these operations render it impervious to the injurious acids which escape during the oxidation of the linseed oil of which the paint is composed. The paint—usually yellow ochre—is, first of all, applied to the back with a steel trowel, and when it is dry—which, unless artificial means be used, may not be for a fortnight—another coat is laid on. The front is painted five or six times, and pumiced

once or twice before receiving a new coat. A final coat is added with a brush, which gives the ground shade, called the *brush colour*. The next stage is the printing, which is effected by means of wood-blocks, each colour in the pattern being stamped on the canvas by means of a separate block. They are usually made of pear-tree wood, and are about 18 inches square. Steel tools are commonly used to engrave the pattern on the block, but this is now sometimes done with heated iron punches. The floor-cloth is laid beside the printers on a table with a padding of flannel or felt; on another table are placed the colours, on which each printer in turn dabs his block and then forces it down on the floor-cloth by means of a small screw press. The printing is now sometimes done by machinery, the process in this case being an imitation of hand-printing.

Linoleum consists of canvas backed with pigment and size, the wearing surface of which is covered with a mixture of pulverised cork, oxidised linseed-oil, common resin, and kauri resin. The chief element is the pulverised cork, for which waste cork-cuttings are used; these are reduced to fragments about as large as a pea by means of a series of steel discs, furnished with teeth which revolve on a shaft against steel plates with serrated ends; they are then ground into powder by millstones. The oxidised linseed-oil is obtained by setting long pieces of calico, called "scrim," in an upright position, and then "flooding" them with boiled oil, which spreads over their surface in thin films. This is continued for 6 or 8 weeks, at the end of which time the oil has become about half an inch thick. The scrim and the films together form a "skin," but the oxidation of the oil results in the decomposition of the scrim. The oil is now mixed with the resin in the proportion of from 4 to 8 cwt. of oil to 1 cwt. of each of the two kinds. For this purpose a pan is used which has an outer jacket filled with steam; it is covered with an air-tight lid, and within the pan and at a valve at the bottom there are stirrers. The common resin is placed first in the pan; when it has melted, the kauri and oil are added, the steam being shut off as soon as the mixture becomes warm, as the oxidisation of the substances furnishes the requisite amount of heat. When the "cement" has been formed, the valve is opened, and it descends between grinding rollers. It is then allowed to cool, but heated again before being mixed with the cork. The next step is to fuse the ingredients more completely together by passing them into a cylinder, which has a steam jacket, and contains fixed and revolving knives. The mixture is then formed into a sheet through the action of two rollers, one of which is kept cool, while the other is heated with steam. This sheet is broken into small pieces, which are forced into the canvas by means of steam-heated rollers of cast iron. A backing of size and pigment is then given to the canvas, after which it only requires to be printed and cut into separate pieces.

Floors are ordinarily made of wood, especially in the upper storeys of private houses. In large buildings fireproof floors constructed of bricks, with iron girders, are now common. For basement-floors tiles, cement, and flagstones are often used, but here, too, wood is a common material. *Single-joisted* floors are made by laying planks close together over a series of beams termed joists, which are usually about 10 inches deep and about 3 inches broad. The distance between the joists varies from 12 to 16 inches from centre to centre. When they are more than 10 feet long they require to be strutted, to prevent their falling out of position. The most effectual kind of strutting is the "herring-bone," which consists of pieces of wood nailed one across the other between the joists. Beneath the joists are the laths, to which is attached the ceiling of the room below. The "pugging" or "deafening"—cement or coarse plaster which prevents the transmission of sound—is placed between the flooring and the ceiling. In *double-joisted* floors there are two sets of joists, separated by larger beams called *binders* or *binding-joists*: the upper row are called *bridging-joists*, because they bridge over the space between the binders: this is termed a bay, and has a width of about 6 feet. The *framed floor* has both binding and bridging-joists, but the main support is here given by the *girders*, which are either entirely of wood or iron, or of iron plated with wood. The binding-joists are attached to the girders by means of *tusk-tenon* joints, and to these the bridging-joists are notched. The methods of jointing the flooring-boards vary: in the *grooved-and-tongued* joint a tongue at the edge of one board is inserted in a groove in that next it. The flooring-boards are usually from 4 to 6 inches broad, and about $1\frac{1}{4}$ inch thick. Where floors are made of soft wood, as in England, it is common to stain and varnish the surface for a distance of about $2\frac{1}{2}$ feet round the walls.

Flora, a Roman goddess of flowers and of spring. Her worship was adopted at a very early period of Rome's history, and is hardly extinct yet, since there can be little doubt that the dedication of the month of May to Our Lady, and the practice that still prevails in some parts of England on the 1st of May for children to carry bowers of flowers containing a female figure, had its origin in the worship of Flora. Her feast—called Floralia—was kept from April 28 to May 1.

Florence (*Firenze; Florentia Tuscorum*), a North Italian town, capital of a province of the same name, 143 miles N.W. of Rome, and 50 miles N.E. of Leghorn. It is surrounded by hills, and it has extensive suburbs and villas upon the heights. The Arno, flowing through the city, divides it into two parts, most being to the N. The river is from 100 to 150 yards wide, and is crossed by four bridges —the marble Ponte della Santa Trinita (which has three arches and is adorned with statues), Ponte Vecchio (which is lined with shops and has a covered way), and two suspension bridges. On both sides of the river are quays called Lung'Arno, and, though the city walls have been removed, the towers of the gates still exist. The streets are narrow, but clean and well-paved. There are many piazzas, the chief of them being Piazza della Signoria, with its marble fountain and statue of Cosmo I., and that of Santa

Croce. But the great feature of Florence is the Duomo, or Cathedral, built 1298–1474, and completed as to the façade in 1887. This is said to possess the largest dome in the world. It was designed by Brunelleschli. It stands in the great square, and is built of brick, which is cased inside and out by mosaics, the outside casing consisting of black and white marble. The campanile, or bell-tower, 293 feet high, is by Giotto, and is also encased in marbles, and ornamented in relief by illustrations of the progress of civilisation. The octagonal church of San Giovanni has very beautiful bronze gates. In the church of Santa Croce are the tombs of Michael Angelo, Galileo, Machiavelli, and Alfieri, and in the piazza is a monument to Dante, erected in 1865. There is a famons gallery of painting and statuary in the Uffizi; and the Pitti Palace, once the residence of the King of Italy, has 500 examples of the great masters, and attached to it are large gardens. The Bargello, formerly a prison, is now a national museum, and the Medicean Library ranks next to the Vatican for its collection of MSS. The Magliabecchian Library has a fine collection of books and MSS., and is the national library. There are two other public libraries. Of other palaces the Palazzo Vecchio was the residence of Cosmo I. Other points of interest at Florence are the Accademia della Crusca, which is the literary headquarters of the country, the University, which has a good natural history collection—many of the subjects in which are modelled in wax—the Observatory, and the Botanic Garden. There is a good railway connection with the other chief towns, and there is considerable trade in silk, woollens, strawhats, porcelain, mosaics, and works of art. The silkworm is reared in the neighbourhood. Florence was originally a colony of Roman soldiers, but after the rise of the Empire little was heard of it till about the 12th century, when it became the resort of bankers, jewellers, and goldsmiths. Its full tide of glory set in when it became almost the home of the Renaissance, and when in 1434 Cosmo de Medici was the reigning merchant-prince. After the fall of the Repnblic, one member or another of the Medici family ruled as Dukes till 1737, when it became part of Tuscany, to be merged later in the kingdom of Italy. From 1865 to 1871 it was the capital of the new kingdom. Among the many names that have made Florence illustrious may be mentioned Dante, Petrarch, Boccaccio, Lorenzo the Magnificent, Michael Angelo, Leonardo da Vinci, Benvennto Cellini, and Savonarola.

Florentine Experiment, THE, was to determine whether water was compressible to any appreciable extent. It was performed in Florence by Torricelli, in the year 1661, and from the result was deduced the fact that water is incompressible. Later experiment has shown this conclusion to be incorrect, for water does admit of a certain amount of compression, and instruments have been designed to measure this amount. The Florentine experiment consisted in filling a hollow sphere of gold with water, plugging up the orifice by means of which the filling was effected, and then snbmitting the sphere to great external pressnre. It was a known fact that of all solids with given surface area the sphere possesses the greatest volume, and it was therefore recognised that if the golden sphere should undergo any deformation into an ellipsoidal form, its bulk and, therefore, that of the enclosed water would be diminished. The actual result was that rather than submit to any appreciable diminution, the liquid forced its way through the pores of the metal, and appeared as dew on the ontside. Francis Bacon had performed the same experiment with a leaden sphere some twenty years earlier.

Flores. (1) The westernmost of the Azores, about 30 miles in length by 9 miles wide, and containing an extinct crater, now a lake. (2) An island of the Indian Archipelago, E. of Java, being 100 miles long by 50 miles wide. It is mountainous, and has volcanic peaks, reaching a height of 7,000 feet. Some sandalwood is exported. The island gives its name to a strait and to a sea. (3) An island of the South Pacific, opposite Vancouver, 15 miles long and 2 to 6 miles broad.

Florida, a peninsnla and one of the United States of North America, having Alabama and Georgia on the N., the Gulf of Mexico on the W., the Atlantic on the E., and the Gulf of Florida on the S. It is 380 miles long, with an average breadth of 80 miles, and contains 59,268 sqnare miles. The surface is for the most part level, and in the S. consists of marsh and swamp, the coast being flat and fringed with islands of sand separated from the mainland by a succession of shallow lagoons. There are many lakes, some of them very deep, the larger of which average from 8 to 15 miles long. One of them disappeared in 1892, through openings at the bottom. The most important rivers are Appalachicola and the Snwance, flowing into the Gulf of Mexico, and the St. John's and the Ockloconee flowing into the Atlantic, bnt the navigation is mnch impeded by sand bars at the mouths. There are many islands, the most notable being the group called the Florida Keys, lying about 100 miles S.W. There are some large bays and good harbours, mostly on the E. coast, the most important of them being Chatham Bay and Charlotte Harbonr. The land along the rivercourses is very fertile, and grows tropical plants and fruits in profusion. Cotton, olives, pumpkins, and melons flourish, and sugar, maize, tobacco, and potatoes are largely cultivated. One great speciality of late years is the cultivation of the orange, the groves of which have now become a great feature of the conntry and occupy the attention of many colonists. Cattle-rearing also is largely carried on. Coal and iron are almost the only minerals, though precious stones are said to have been sparingly found. Besides magnificent pine-forests, Florida has abundance of cedars, cypress, and live-oak, the last of which is exported in considerable quantities for the United States naval building-yards. Among the wild animals are the wolf, wild-cat, panther, raccoon, opossum, rabbit, squirrel, and, in the swamps, the brown bear. Birds of many kinds abound, as do fish and tortoises, and there are snakes and alligators. The state is now well served by railways, and sugar, cotton, and oranges

are exported. Among the industries are tanning, a little ship-building, lumbering, and wood-sawing; and there are manufactures of hats, leather, bricks, and waggons. The capital is Tallahassee, and there is a naval station at Pensacola. The country was discovered by Sebastian Cabot in 1497, and was visited by both Ponce de Leon and Hernando de Soto. In the 16th century some French Huguenots founded a colony, which did not prosper. In 1763 it was ceded to England in exchange for Cuba, and in 1781 the Spaniards reconquered it. It was ceded to the United States of America in 1819, and in 1845 was constituted a State.

Florin. The original gold florin was first used at Florence in the 13th century. It took its name either from the city or from a lily, which was the sign stamped on one of the faces. The florin is known in Germany as a gulden, and the modern Austrian gulden still bears the mark *Fl.* The ordinary value of the gulden was from 1s. 8d. to 1s. 10d. English. The name "florin" has only recently been introduced into England.

Florio, Giovanni (1552–1662), was born in London, of Italian origin, his father and mother being Waldensian refugees. In 1576 he was at Oxford as tutor to the son of the Bishop of Durham. In 1578 he published his *First Fruits*, accompanied by a collection of Italian proverbs, and a *Perfect Introduction to the Italian and English Tongues.* In 1581 he became a member of Magdalen College, and teacher of French and Italian. In 1591 appeared his *Second Fruits*, with 6,000 proverbs. In 1603 he published a translation of Montaigne's essays; and it has been supposed, though without much apparent ground, that he stood to Shakspeare as the model of Holofernes in *Love's Labour's Lost.*

Flotation. A body will float in water if its weight be not greater than the weight of the same bulk of water. If the two weights are equal, the body will float in any position below the surface; if the body is lighter than the weight of equal bulk of water, it will rise up to the surface, and be only partially submerged. It then displaces its own weight of water. Thus, ice has a density eight-ninths that of water; eight pounds of ice have the volume of nine pounds of water. This quantity of ice will in floating displace eight pounds of liquid, which occupies eight-ninths the volume of the ice. Hence ice in floating has only one-ninth of its volume out of water—*i.e.* above the surface level. [Hydrostatics.]

Flotow, Friedrich Freiherr von (1812–1883), a German composer, born at Mecklenburg. He was intended for diplomacy, but a visit to Paris in 1827 determined him to music. His *Naufrage de la Méduse* (1839), *Stradella* (1841), and *Martha* (1847) brought him reputation. His later efforts met with no great success. From 1856 to 1863 he was intendant of the theatre at Schwerin, and he then returned to Paris.

Flotsam, or Floatsam, goods floating upon the sea, which belong to the Crown unless claimed by the true owners thereof within a year and a day. In order to constitute a legal wreck, the goods must come to land. If they continue at sea, the law distinguishes them by the barbarous and uncouth appellations of *jetsam*, *flotsam*, and *ligan*. Jetsam is where goods are cast into the sea, and there sink and remain under water. Flotsam is where they continue swimming on the waves. Ligan is where they are sunk in the sea, but tied to a cork or buoy in order to be found again. Such goods are also the Crown's, except claimed as above. For even if they be cast overboard without any mark or buoy in order to lighten the ship, the owner is not by this act of necessity considered to have renounced his property. Much less can things ligan be supposed to be abandoned, since the owner has done all in his power to assert and retain his property. These three are accounted distinct things from wrecks, so that by a royal grant to any-one of wrecks, things jetsam, flotsam, and ligan will not pass. [Jetsam, Ligan.]

Flounder (*Pleuronectes flesus*), called in Scotland the Fluke, a flat fish esteemed for food, common round the coasts of Britain and Northern Europe, spawning at the mouths of rivers, up which it often passes, being taken in the Thames as high as Richmond, and thriving well in ponds. It is, of course, unsymmetrical. Large specimens are about a foot long; the upper side, generally the right, is brownish or greenish-olive, with yellow spots, most vivid in the spring, and disappearing later in the year; the under surface is yellowish white, or it may be coloured like the upper surface. These fish have blunt conical teeth and small smooth scales, with tubercles at the side of the head and at the base of the dorsal and anal fins.

Flourens, Marie Jean Pierre (1794–1867), a French physician and physiologist, graduated M.A. at the University of Montpellier at the age of 19. He then went to Paris, and his first writings were published in 1819. In 1821 he lectured upon sensation, and wrote several papers in physiology. In 1837 he was elected to the Chamber of Deputies, and made a member of the Legion of Honour, of which he became Grand Officer in 1839; and in 1840 he entered the Academy, and from 1846 to 1848 he was a peer of France. His writings are very numerous, and he was one of the first to establish the fact of the constant renewal of the bodily frame. His son, Gustave Flourens, also a biologist of distinction, was killed while fighting for the Paris Commune in 1871.

Flower, an axis bearing sporophylls—*i.e.* a branch bearing leaves specially modified for reproductive purposes. Like other shoots, its existence begins as a bud, known as a *flower-bud*, which originates generally in the axil (q.v.) of a leaf, and, consisting of a growing-point with minute rounded protuberances, the future floral leaves, protected by the over-lapping bud-scales, cannot at first be distinguished from an ordinary leaf-bud. [Bud.] Subsequently, unlike an ordinary shoot, a flower seldom has the internodes between its leaves at all elongated. The axis immediately below the flower

is termed the *pedicel*, and within the flower it is commonly terminated in a conical, rounded, flattened, or discoid, or convex expansion forming the *receptacle*, *thalamus*, or *torus*. A typical flower consists of this receptacle and four kinds of *floral leaves*—viz. the *floral envelopes* or *perianth*, consisting of the *calyx* (q.v.) made up of *sepals*, and the *corolla* (q.v.), made up of *petals*, and the *essential organs* or *sporophylls*, consisting of the *stamens* known collectively as the *andrœcium* and the *carpels*, collectively the *gynœceum*. If both calyx and corolla are present, as in the buttercup, the flower is termed *complete* or *dichlamydeous*, from the Greek *chlamys*, a cloak; but if either or both series of floral envelopes be absent, the flower is *incomplete*. Incomplete flowers with one whorl of envelopes, as in the anemone, are termed *monochlamydeous;* those with no envelopes, as in the ash, *achlamydeous*. If both kinds of essential organs are present in one flower, as in the buttercup, it is *perfect*, *hermaphrodite*, *bisexual*, or *monoclinous* (from the Greek *klinē*, a couch); if either stamens or carpels be absent, the flower is *imperfect*, or *unisexual*, and *staminate* or *pistillate*, as the case may be; whilst if neither class of essential organ be present, as in the cultivated hydrangea or snowball-tree, it is *neuter*. A species is termed *diclinous* when stamens and pistils are present, but in different flowers, and diclinous plants are either *monœcious* (from the Greek *oikos*, a house), where, as in the hazel, oak, and birch, staminate and pistillate flowers occur on the same plant, or *diœcious*, as are the willows and poplars, when they occur on distinct plants. Where perfect and imperfect flowers occur on the same plant, as in the ash, maple, horse-chestnut, etc., it is called *polygamous*.

Some plants produce flowers which never open, remaining, as it were, as permanent buds, though producing fruit. These, as a rule, are only produced late in the flowering season. In the common violet, for instance, the sweet-scented and attractive flowers produced in spring are seldom visited by insects, though secreting honey and having other contrivances connected with their visits, and these flowers very seldom produce fruit. Later in the summer other small, inconspicuous flowers, on shorter stalks, with hardly a trace of corolla and other parts reduced in number, are produced but never open, and these seed freely. They are termed *cleistogene* or *cleistogamous* (from the Greek *kleistos*, shut), other flowers in contradistinction being *chasmogamous* (from *chasmao*, I gape).

No general rule can be laid down as to the order in which the different floral organs reach maturity. The variation in this particular is most important with reference to the stamens and carpels. These either mature simultaneously—*i.e.* the anthers of the stamens are ready to burst and liberate the pollen when the stigmas of the carpels are sticky, in which case the flower is termed *synacmic*, as in the case of the dwarf mallow; or they mature in succession, when the flower is termed *dichogamous*. If, as is most commonly the case, the anthers mature first, the flower is *protandrous* or *proterandrous;* if the stigmas mature first, it is *protogynous* or *proterogynous*. In either case of dichogamy cross-pollination (q.v.) must occur if seed is to be formed.

When the floral receptacle is elongated the leaves of the flower are commonly arranged wholly or partly in a spiral, and are indefinite in number, as in the spice-tree (*Calycanthus*) and in the white water-lily. In the latter instance the green sepals pass gradually into the white petals, the inner ones being green outside and white inside, and the petals becoming narrower graduate into the stamens, thus exemplifying the foliar nature common to all these organs. When the axis is shortened, each series of floral leaves spring from it at one level in a *whorl*. There is typically one whorl each to calyx, corolla and gynæceum, though often two in the andrœcium. The leaves in each whorl are generally *alternate* with, or opposite the spaces between, those of the preceding whorl, but in *Primula* the stamens are *superposed* to, or stand in front of, the petals, and in *Iris* the carpels are superposed to the stamens. The number of leaves in each whorl is typically three among Monocotyledons, and five among Dicotyledons, which is expressed by saying that the floral symmetry is *trimerous* in the former and *pentamerous* in the latter; but increase of the stamens to an indefinite number is common among Dicotyledons, as is also a reduction of the parts in each whorl to two, and in both groups a reduction in the number of carpels. Where all the parts in each floral whorl are similar in size and shape the flower can be divided by several radiating planes of symmetry, and is called *polysymmetric;* whilst where, from inequality of size or difference of form of the parts in any one whorl, the flower can only be divided by one such plane, it is *monosymmetric*. Polysymmetric flowers are often called *regular* or *actinomorphic* (star-shaped), and monosymmetric ones, having their parts in pairs, are called *zygomorphic* (yoke-shaped) or, less accurately, *irregular*. Flowers are occasionally truly irregular or *asymmetric*, not being symmetrically divisible by any plane. The primitive type or original form of flower in every large group would seem to have been polysymmetric, and most of the departures from this primitive condition are adaptations to secure cross-pollination by insects.

Almost all these modifications by which flowers depart from the typically simple condition of four or five whorls of similar, separate organs, three, five, or two, in a whorl, may be explained as due either to cohesion, adhesion, abortion, suppression, chorisis, or unequal growth. *Cohesion* (q.v.) is the union of like parts, such as sepals to sepals; *adhesion*, the union of dissimilar parts, such as stamens to petals. Nearly all cases of so-called cohesion and adhesion in the flower are really due to the *intercalary growth* of the receptacle in rings or tubes, below, in the first case, a single whorl, and, in the latter case, below two or more contiguous whorls. When, for example, in the bramble, rose or apple, sepals, petals, and stamens are all carried outwards or upwards on a receptacular disc or tube round the gynæceum without adhering to it, they are termed *perigynous* (from the Greek *pĕri*, around), or, as the tube was formerly called a

calyx-tube, *calyciflora*l. [CALYCIFLORÆ.] If the adhesion goes a step farther, so that the carpels are enclosed in an adherent receptacular tube, and the sepals, petals, and stamens appear to spring from the top of ovary, this ovary is termed *inferior*, the calyx *superior*, and the "insertion" of petals and stamens *epigynous* (Greek *ĕpi*, upon).

Abortion is the reduction of an organ to a mere rudiment, generally with loss of its original function, as when in *Salvia* two stamens no longer produce pollen, being in consequence known as staminodes. *Suppression* is the complete absence of a part, the typical presence of which is often only indicated by comparative anatomy or by cases of reversion, as in the absent fifth stamen in *Salvia*, the three absent in *Veronica*, or the third carpel absent in most grasses.

Actual multiplication of the number of floral whorls (*pleiotaxy*) occurs in many double flowers (q.v.); but increase in the number of parts (*pleiomery*) is largely due to *chorisis—i.e.* the splitting or branching of the floral leaves early in their development. This may be either *collateral*, when the resulting branches are side by side or in the same whorl; or *co-radial*, when they are superposed, one in front of the other, on the same radius of the flower. The stamens of the orange, for instance, though described as "polyadelphous" or coherent in several groups, are really few in number, but branched; and the "indefinite monadelphous" stamens of the mallows are due to the branching of five, which have subsequently been carried up on a receptacular tube. Cohesion, adhesion, and even chorisis will often not interfere with the polysymmetric character of the flower; but abortion, suppression, and the irregular growth of individual members in a whorl will commonly do so.

Many of the facts as to floral structure and symmetry are conveniently represented for comparative purposes in a *floral diagram* or diagrammatic ground-plan, each whorl being represented by a circle. These diagrams are either *empirical*, merely stating the facts, or *theoretical*, filling in suppressed parts in accordance with some type. Plants, belonging to one Natural Order, will commonly have identical, or nearly identical, diagrams, and diagrams may also serve to suggest even more remote relationships. Most facts expressible in diagrams and some others can also be expeditiously represented in *floral formulæ*. Various notations are in use for these formulæ using unnecessary abbreviations for sepals, petals, stamens, and carpels. Omitting these, we may take the figures before the first full stop to refer to the sepals; those between the first and second, to the petals; those between the second and third, to the stamens; and those after the third, to the carpels; round brackets ( ) indicate cohesion; square ones [ ], adhesion; a line above or below the last figure shows the ovary to be inferior or superior; a dagger (†) indicates abortion; zero (0), the suppression of a whorl; plus (+), the occurrence of more than one whorl of any one kind of floral leaves; the multiplication sign (×), branching or chorisis; a waving line (~) over a figure, spiral arrangement; ∞, an indefinite number of parts; | before the number representing a whorl, that it is superposed on the preceding one; ×, that its parts are arranged diagonally; and the signs → and ↓ before the formula, monosymmetry in the transverse or lateral plane or in the median (antero-posterior) plane respectively. Formulæ, like diagrams, may be empirical or theoretical. Thus, the formula of the flower of the lily is $3.3.3+3.\underline{(3)}$, that of *Amaryllis*, $3.3.3+3.\overline{(3)}$; that of *Iris*, empirically, $3.3.3.\,|\,\overline{(3)}$, theoretically, $3.3.3+0.\overline{(3)}$; that of *Orchis*, empirically, $\downarrow 3.3.[1+\dagger 2.\overline{(3)}$, theoretically, $\downarrow 3.3.[1\dagger 2+\dagger 3.\overline{(3)}]$; that of the mallows, empirically, $(5).[5.(\infty)].\underline{(\infty)}$, theoretically, $(5).[5.(5\times\infty)].\underline{(\infty)}$; and that of the Cruciferæ (q.v.), $2+2.\times 4.2+2^{\times 2}.(2)$. [ÆSTIVATION, CALYX, CARPEL, COLOURS, COROLLA, POLLINATION, STAMEN, VEGETABLE.]

Flower, SIR WILLIAM HENRY, zoologist, was born in 1831 at Stratford-on-Avon. He paid much attention to zoology, and took part in the Crimean campaign as assistant-surgeon. He was afterwards appointed demonstrator in anatomy at the Middlesex Hospital. In 1861 he became conservator of the Hunterian Museum, in 1869 Hunterian Professor of Comparative Anatomy and Physiology, and in 1884 director of the Natural History Department of the British Museum. He is F.R.S., and LL.D. of Edinburgh and Dublin. He has written much upon anatomy, osteology, zoology, and anthropology.

Flowers, ARTIFICIAL. The manufacture of artificial flowers is carried on by various races, both civilised and savage, and many different materials are employed in their construction. Ua-paper is in use among the Chinese, while the natives of the Bahama Islands are skilful in making flowers out of shells. In Europe the chief seats of the industry are in France, England, and the Netherlands. Artificial flowers are chiefly used for decorating ladies' dresses; the methods employed in their manufacture have much improved of late years, and the industry now gives employment to a large number of persons, many of whom are women and children. The flowers are generally made of cambric, fine calico, crape, muslin, satin, and similar materials. The ordinary process is as follows:—The pistil and stamens are the first part finished; they consist of pieces of sewing silk, the tips of which are moistened with gum and then powdered with flour, tinted yellow, to give the appearance of pollen. These are attached to a piece of wire, and, after the petals and sepals have been placed round them, the whole is securely bound together with fine thread or silk. The stalk is formed by the addition of other wires, also placed within the thread, and surrounded by green tissue paper. To these the leaves are fastened by pieces of fine wire, the lower extremities of which are hidden by the tissue paper. The petals, sepals, and leaves are produced by means of stamping machines or punches, called "irons," which differ according to the size and form required. They are then subjected to the process called "goffering," which consists in giving them a

rounded or curled form by means of an iron ball, which is heated and pressed down on the petal or leaf, the latter being previously laid on a cushion. The ribs and veins of the leaves are produced by other kinds of goffering-irons. The variety in the tint of a petal is imitated by dipping it in coloured liquid and then moistening it with water, after which more dye is added in the part where the deepest tinge is required; the additional colour then radiates outwards producing less effect the farther it moves from its centre. A gloss is given to the upper surface of leaves by covering them with gum-arabic and scattering powdered nap of cloth over the gum when it has become sufficiently dry. Powdered glass and potato-flour also are sometimes dusted over the leaves and petals.

Fluid is a substance that allows indefinitely great deformation under the action of small stresses. In other words, the particles of a fluid are able to move about with more or less perfect freedom without being constrained to remain in the neighbourhood of other particles. This is the distinction between a fluid and a solid, and is expressed mathematically by saying that a fluid has no rigidity; the particles of a fluid can slide or *shear* past each other under the action of extremely small forces. [Elasticity.] The question of the time taken to effect this shearing does not occur in the definition, which, therefore, includes such substances as sealing-wax and pitch under the head of fluids rather than regarding them as solids; for experiment shows that these substances do actually undergo continuous change of shape under the action of such small forces as their own weights. Nevertheless, any attempt to effect similar changes in short time by the more sudden action of greater forces renders them solid-like in behaviour; they fracture rather than submit to the rapid deformation. Distinction must be made between a hard fluid such as sealing-wax and a soft solid such as a tallow candle. The latter is the more readily deformed by small forces, but the deformation reaches its limit almost immediately after the forces are applied. A tallow candle will not bend to an indefinite extent under the action of its own weight when supported in a horizontal position at its extremities, however long it be left in that position. A stick of sealing-wax will so behave in the course of weeks, and will ultimately fall down from its supports. Under the action of great shearing stresses there are various metals and other substances that behave like fluids in that they "flow" in the direction of the lines of force. In fact, most substances do so to some extent, though the amount of flow may be very slight before fracture and a dissociation of particles occur. Copper wire may be forced through holes of smaller diameter and come out the other side of greater length and smaller sectional area. If the metal be occasionally annealed, the process may be repeated again and again. Fluids proper are divided into two classes, liquids and gases. The distinction between these is that the former are practically incompressible under the action of small forces, whereas the latter are very readily compressible. Liquids have, therefore, a very great modulus of elasticity of bulk, though small modulus of *rigidity* or elasticity of form, whereas both moduli are small for gases. [Gas, Liquid, Elasticity.]

Flukes, a group of parasitic worms constituting the order Trematoda. They are all composed of a single segment, and their form is typically flattened like a leaf, though some are cylindrical. They secure attachment to the body of their host by one or more suckers, whence they are often known as the "suctorial worms." The mouth usually leads to a pharynx, and this to a forked alimentary canal; there is, however, no anus. Except the abnormal genus *Bilharzia*, the Flukes are all hermaphrodite, and in some cases self-impregnation certainly occurs, as, *e.g.* in *Polystomum integerrimum*. The Flukes are divided into two groups according to whether they exhibit "alternation of generations" (q.v.) or not; if they do not they are known as the "monogenetic." In these development is direct, with some few exceptions, as *Calicotyle*, which lives in the Rays. All the members of this group are external parasites. The "digenetic" have one or more (usually many) nonsexual generations intervening between the egg and the mature sexual form: the adults are always parasitic in some vertebrate animals, while the larvæ are free-swimming at another stage and live in mollusca in another. Both the monogenetic and digenetic forms are classified into families based on the number of suckers; thus the former is divided into the *Tristomeæ* and *Polystomeæ*, and the latter into the *Monostomidæ*, *Distomidæ*, etc. The best-known of the *Trematoda* is the Liver-Fluke (q.v.). *Fasciola* (*Distomum*) *hepatica*, which is the cause of the disease known as sheep-rot or *liver-rot*. An account of the structure and life history of this form, serving as a general type for the class, is given under Liver-fluke (q.v.). This species occasionally occurs in man, but is mainly found in ruminants. Among other human parasites belonging to the class are *Distomum ringeri*, which attacks the lungs, and the African *Bilharzia hæmatobia*, which lives in the blood-vessels of the bladder.

Fluor, Fluor-spar or Fluorite, calcium-fluoride (CaF_2), is a common mineral in metalliferous veins, being especially associated with lead-ores. It takes its name from the Latin *fluo*, I flow, from being used as a "flux" in the smelting of lead and copper; and it gives its name to the element fluorine (q.v.), which is obtained from it. Fluor is generally crystalline in cubes, or less commonly in octahedra, and is transparent, or nearly so. Being brittle, it breaks readily, having perfect octahedral cleavage; but it is 4 in Von Mohs' scale of hardness. It has a vitreous, often splendent, lustre, and is remarkable for the great range of colours in which it may occur: colourless, violet (the most common), blue, green, pink, or yellow. The violet variety is known as "blue John" in Derbyshire, and the banded form, alternately violet and colourless, is known as "Derbyshire spar," and is valued for ornamental purposes. Its specific gravity is about 3. Before the blowpipe it decrepitates, tinging the flame red; and, when heated with sulphuric acid, it gives off fumes of hydrofluoric acid

(HF), which corrode glass. This property is utilised in etching on glass.

Fluorene, a hydrocarbon of composition $C_{13}H_{10}$, which is found in the portion of coal tar boiling at about 300° C. It forms white crystals with a violet fluorescence, which melt at 113° C. and boil at 295° C.

Fluorescein, or Resorcinol Phthalein, results from heating phthalic anhydride with resorcinol (q.v.). It forms fine yellow-red crystals of composition $C_{20}H_{12}O_5$, which give by solution a yellowish-red liquid exhibiting a magnificent green fluorescence. By the action of bromine, *Eosin* (q.v.) is obtained, the basis of a number of dyestuffs, while its benzyl derivative forms a fine yellow dye known as *Chrysolin*. Owing to its capacity for strongly dyeing water, it is used for tracing underground streams.

Fluorescence, in physical *Optics*, means a special transformation of light-waves when received into an absorbing medium. Sunlight, falling on a dark object, usually raises its temperature, and causes it to emit heat. It does not send back light-waves again, but it has effected the transformation of light-waves of short period and wave-length into heat waves of longer period and wave-length. Energy is absorbed in the form of short waves and emitted in long waves—a process of degradation that occurs continually in nature. There is another form of degradation of the same sort, when light-waves are transformed into other light-waves but of lower refrangibility. Violet rays may be absorbed by a substance and emitted as green or red light; the new modification is still appreciable to the eye, whereas in the former case it was only appreciable to the touch. This latter transformation is known as *fluorescence*, and was first observed by Brewster to be effected by an alcoholic solution of chlorophyll; sunlight, passing into the green solution, exhibited a fine red track through the liquid. Stokes has shown that many substances are more or less fluorescent, such as bone, white paper, cotton wool, etc., and that the rays transformed may be of such high refrangibility as to be beyond the limit of vision when in the incident beam. The transformation of long waves into those of shorter period is termed *calorescence* (q.v.).

Fluorides are substances which may be regarded as derived from one or more molecules of hydrofluoric acid (HF), by replacement of the hydrogen by some element or group of elements. The acid itself may, therefore, be called *hydrogen fluoride*. Some of the most important fluorides are *calcium fluoride* (CaF_2), largely found naturally as fluor spar or Derbyshire spar; *cryolite*, a double fluoride of sodium and aluminium (Na_3AlF_6), used for the manufacture of soda and as a source of aluminium; and *potassium fluoride* (KF) of frequent use in pure chemistry. Many organic fluorides are known, and these, as in the case of the inorganic fluorides also, show great resemblance to the corresponding chlorides.

Fluorine (F, atomic weight 19), an element which, though its existence had been recognised since the beginning of the present century, has only been isolated within recent years. It exists naturally, combined with calcium in fluor-spar (CaF_2), and with sodium and aluminium in *cryolite* (Na_3AlF_6), and in small quantities combined with other elements in the bones, teeth, etc., of the human organism. Though many chemists had previously attempted by various methods to isolate the element, it was first prepared in 1886 by Moisson, a French chemist, who obtained it by the electrolysis of dry liquid hydrofluoric acid (HF) containing dissolved in it some potassium fluoride (KF). Owing to the exceedingly reactive nature of the gas, the U-tube and all the other apparatus employed for the electrolysis, etc., consisted of platinum. The fluorine was evolved at the positive electrode. It is a gas of a faint yellowish-green colour. It reacts very energetically with most substances; thus silicon, boron, sulphur, arsenic, and antimony take fire immediately upon immersion into the gas, and iron and many other metals burn in it, if previously slightly heated. Most organic compounds take fire in the gas, and with hydrogen it at once explodes, even in the dark, forming hydrofluoric acid (HF) (q.v.). Owing to this energetic nature of the gas, the study of it has proved dangerous and laborious, and most of the knowledge is due to M. Moisson. Its atomic weight and properties show it to be intimately related to chlorine, bromine, and iodine, with which elements it forms the group known as the Halogens (q.v.).

Fluotype, a photographic printing process, invented by Robert Hunt in 1844, in which paper, coated with a solution of potassium bromide and fluoride and sensitised by silver nitrate, was employed. After exposure to light, the image was further developed by a solution of ferrous sulphate. It is not much used at present, but is interesting as being one of the early printing processes.

Flushing (Vlissingen, Flessingue), a Netherland town in Zeeland, on the isle of Walcheren, at the mouth of the West Schelde (which is here from 2 to 3 miles broad), 50 miles S.W. of Rotterdam and 38 miles N.W. of Antwerp. Its forts, together with a fort on the opposite side, command the river, with which it communicates by two deep canals, which admit large vessels into the town. There is a town-hall and an exchange, and a statue of De Ruyter, who was a native. There are a ship-building yard and a large floating dock. The chief industries are brewing, soap-making, fulling, and oil-making. From 1585 to 1616 Flushing was in the hands of the English as a pledge for debt, and in 1809 during the Walcheren expedition it was bombarded, and its old town-hall and other interesting buildings were destroyed.

Flute, a wind instrument, which has been in use from a remote period of antiquity. Among the Greeks professional players took part in religious celebrations, and contests of rival performers were a common feature of daily life. There are two kinds of flute—the *direct* and the *transverse*. The old English flute, or *flute-à-bec*, belonged to the former class; and it received its name from the shape of the mouthpiece at the upper end of the

tube, which was supposed to resemble the beak of a bird. Flutes of this kind are held by the player at right angles to the line of the face, whereas the transverse or "German" flute is held across the body. Transverse flutes have an oval-shaped mouth-hole in the side of the tube. The *flute-à-bec* had 7 finger-holes, but the modern instrument has 6 finger-holes and about 14 keys. The transverse flute supplanted the *flute-à-bec* about the middle of the 18th century, mainly owing to the influence of Handel, who made use of it in his orchestra. It has been much improved since his time, and now has a compass of nearly 3 octaves from the middle D to A sharp. Among the various kinds of transverse flute are the *tierce* or E flat, the octave, and the C piccolo.

Flute Mouths (*Fistulariidæ*), an Acanthopterygian family with four genera, allied to the sticklebacks, from the Atlantic and Indo-Pacific. The anterior bones of the skull are produced to form a long tube, which ends in a narrow mouth. Like the Syngnathidæ, they are called Pipe-fishes (q.v.).

Flutings, or FLUTES, a term of classical architecture, denoting the hollows or channels carved perpendicularly on the surface of columns. The Tuscan order alone has no flutings. On the Doric column there are 20, which are carried up as far as the capital, and are separated by a sharp edge or arris. Ionic, Corinthian, and Composite columns have 24 flutes, alternating with small fillets; in these orders the fluting ceases below the neck and above the base of the column. A series of convex beads is sometimes worked in the flutes to about a third of their height; this moulding, which is called *cabling*, does not occur in the Doric order. A kind of flute may sometimes be seen on Norman pillars, as, for example, in the crypt of Canterbury cathedral; and, as late as the 12th century, the ornament was used in Italy and other parts of the Continent. The mediæval flutings were often arranged in diagonal patterns, and afterwards assumed zigzag and other forms.

Flux (from the Latin, *fluo*, I flow). 1. Any morbid discharge from a mucous surface may be called a flux. The most common use of the term is in the expression "bloody flux," a synonym for dysentery.

2. A term used to denote those ingredients that are added to an ore in the process of reduction, for the purpose of separating out impurities and enabling the metal to run together. Siliceous impurity is removed by *white flux*, which combines with it to form a fusible glass; this flux is composed of a mixture of the carbonates of soda and potash. *Black flux*, which contains powdered charcoal and potassium carbonate, similarly removes siliceous matter from metallic ores at a high temperature in a furnace, and also helps to deoxidise any metallic oxide. Calcium carbonate, or limestone, is used in the reduction of iron ores, being much cheaper than the other carbonates. [WELDING.]

Fluxions, the name given to the differential and integral calculus as developed by Newton. His representation of variable quantities as being described by a continuous motion of a point introduced the idea of "flow" from one value to another, and hence the term "fluent" for such a variable. The notation of the calculus adopted by Newton differed from that of Leibnitz, and was gradually replaced by the latter. Thus the differential coefficient (q.v.) of x with regard to t would in the former system be denoted by x and in the latter by $\frac{dx}{dt}$.

Fly-catcher, any bird of the Passerine family Muscicapidæ, with 44 genera and 283 species, very abundant in the warmer regions of the Eastern hemisphere and Australia, more sparsely distributed in temperate regions and absent from North and South America. The wings are long, and the feet slender; the bill resembles that of a swallow, and is set with bristles at the corners of the mouth to aid in retaining the insect prey. The type-genus Muscicapa has 12 species from Europe and Africa, and three of them are British summer visitants. The Spotted Fly-catcher, about $5\frac{1}{2}$ inches long, is delicate brown above, with some darker spots; the breast is whitish, deepening into yellow on the sides and marked with long brown streaks. It has no song, but a few twittering notes. The Pied Fly-catcher (*M. atricapilla*), with black and white plumage, is somewhat smaller; *M. parva*, the Red-breasted Fly-catcher, has been known to occur. As their name denotes, all these birds prey largely upon insects.

Fly-wheel, in *Engineering*, means a large wheel with heavy rim, worked by an engine for the purpose of storing up energy and so acting as an accumulator, from which energy may be taken as required. In certain engines that are uniformly driven, and whose energy is uniformly abstracted at the same rate, a fly-wheel is unnecessary. In others the energy is required at a uniform rate, but is supplied irregularly as in the case of a foot-lathe or of a high-pressure engine, where the full pressure of steam in the cylinder only lasts for a small fraction of the stroke. In others the demand for energy is intermittent, so that it could not, except with much waste, be taken direct from the engine; such a case is seen in the rolling-mill (q.v.); while the metal is between the rolls the demand for energy is great; when the metal has passed through, the engine, of course, goes on, but there is little call on it. Finally, in cases like locomotives, the engine works direct on such heavy masses that these act as accumulators without requiring a rotary motion.

Flying signifies the lifting and propulsion of a body into the air by means of a supply of self-contained energy. The elevation of a balloon into air is due to its small density, the bulk of air actually displaced being of greater mass than that of the balloon itself; the balloon does not lift itself by means of a store of kinetic energy it possesses, but is thrust upwards by the surrounding fluid just as a bubble of air is thrust upwards through water. Moreover the balloon itself, without engines and

propellers on board, cannot direct its motion, excepting in so far as it may vary its height by throwing out ballast or by permitting the escape of gas. It can only in part regulate its horizontal movements, and then only inefficiently, by choosing its elevation and submitting itself to the wind that may blow horizontally at that elevation. A balloon fitted with some such mechanism as a screw-propeller, and supplied with sufficient motive power to work the screw rapidly, partially solves the problem of producing a flying-machine, but only partially; for a flying bird has a density greater than that of air. Whether it has any arrangement for introducing air into portions of its structure, and so rendering itself specifically lighter than before, does not alter the fact that it is always specifically heavier than air. A bird shot dead while on the wing falls to the earth at once; its mass is the same, but its energy is now unavailable.

A bird could not fly unless air were present. If placed in a vacuum, for all its flapping of wings it would fall vertically with determinate acceleration. Thus the air is essential to its flying, and it is air-resistance that in some way prevents falling. An ordinary china plate dropped into a tank of water will not fall vertically, but will oscillate from side to side, and take some time to reach the bottom. In certain parts of the motion the plate actually moves upwards, in opposition to gravity, and evidently enabled to do so by reason of its kinetic energy, as a pendulum-bob rises for half its swing by reason of its kinetic energy at the lowest point. It is clear that the shape of the plate has much to do with this sliding motion backwards and forwards through the liquid, for the path of motion is immediately affected by altering the convexity of the plate. The case of a boomerang (q.v.) is also interesting in this connection; this weapon may by skilful projection be made to travel obliquely upwards on an "inclined plane" of air and to return by nearly the same route. In both these cases special initial motions, combined with special shaping, may produce resultant motions that are in opposition to those laws of gravity which only hold so long as the effects of air-resistance are disregarded. But neither the plate nor the boomerang are able to alter their shape during flight, nor to change by exertion of force their supply of kinetic energy or their speed of motion. And now to come back to the bird; such a creature has developed a system specially adapted to take advantage of air-resistance and to alter its shape from time to time, and a muscular power that is simply tremendous in proportion to its total weight. Birds rarely weigh more than 30 lbs.; and their weight is never condensed into a volume of small surface area, but is spread out so as to be very thin in one dimension and extended in the other two. Given at one instant a bird in the air with a certain imparted speed obliquely upwards, simultaneous motion of the individual feathers may so modify the ordinary force-relations as to send the bird sailing along a path that is certainly not parabolic. [Gravity.] Tail guidance may render this path at will either rectilinear, circular, spiral, or otherwise curved with greater complication. And so slight is the friction between the surface of the bird and the air that straight-line horizontal motion of this passive nature may continue for very great distances before the speed of the bird is perceptibly diminished; and, excepting for the effort of guidance, it would seem as though the bird moved without exertion. Instantaneous photographs of flying birds, taken by Marey and by Anschütz, have shown that the individual feathers do so modify their relative positions in the manner just mentioned. During a stroke of the wing downwards the feathers are ranged so as to offer far more resistance to the air than during the upward movement. Their motion may perhaps be roughly compared to the opening and closing of Venetian blinds; the feathers are closed during the downward stroke and open during the return. A hawk in descending vertically upon its prey probably keeps its wing-feathers open so as to fall the more rapidly, its wings being extended for the sake of a truer balance.

Some idea of the nature of flying may now be understood; when the reason of "sailing" in the air is clear, the question of propulsion becomes much simpler, and is indeed that part of the problem of flying that is likely to be the first solved by mankind. Self-propulsion is nevertheless practically independent of "sailing," though the mechanism which makes the one possible to the bird also renders the other possible. The swimming of a fish by movement of its fins is precisely similar to the self-propulsion of a bird. But in the one case the medium is an almost incompressible fluid; in the other case the fluid is highly compressible. Yet the modified and enlarged fins of a flying-fish enable it to "swim" through the air for short distances, and this great difference in the two media would seem to demand not disproportionate strength and energy of the flying mechanism, but the special ability to vary its shape and surface.

Attempts have been made by mankind from time immemorial to construct flying-machines, but never with success. The mechanical difficulties of such a design, based on the principles of bird-flying and of bird-structure, are in many ways extreme and have never really been faced; in fact, they have never been understood. Yet there is no doubt that the design is theoretically possible, that a man may construct wings for himself to work, or may build an aërial vessel worked by some motive-power compactly stored that shall propel itself and carry its engineer. But before this is achieved the easier question of balloon-propulsion should be taken up and solved. [Balloon.]

To some extent the "dirigeable" balloons of the French engineers represent a successful solution of this easier problem; and in regard to true flying, recent experiments by Prof. Langley and by Maxim have led to fuller knowledge of the requisites of a self-supporting machine. Maxim's efforts have been directed to the construction of an engine that shall combine maximum of power with minimum of weight, and have apparently been highly successful.

Flying Buttress, a structure built across the span of an aisle, to resist the thrust of the roof.

Flying Fish, any individual of the genus Exocœtus, with 41 species, from tropical and sub-tropical seas, two of them—*E. evolans* from the Indian Ocean, and *E. volitans* from the Mediterranean—sometimes wandering to the British shores. They are from ten to twelve inches long, though specimens of eighteen inches are recorded, with the pectoral fins reaching in some to the anal fin, and in others to the tail. Kingsley thought that the motion of these fish through the air was true flight, and others have come to the same conclusion. It appears, however, to be a leap prolonged by the parachute-like action of the fins, which are kept distended; and any deviation from a direct course is due to currents of air, not to the will of the animal. The rate of "flight" is about 10 miles an hour, but it can only be kept up for about 500 feet. [Flying Gurnard.]

Flying Fox, a name for any individual of the family Pteropidæ, from their fox-like head. They are also called Fruit Bats, from their diet. [Bat.]

Flying Gurnard, any of the three species of Dactylopterus, from the tropical Atlantic, Indo-Pacific, and the Mediterranean. Adults attain a length of 18 inches, and take flight-like leaps, like the Flying-fish (q.v.), aided by their abnormally long pectoral fins. The young fish cannot "fly."

Flying Lemurs, an aberrant family (Galeopithecidæ), sometimes classed with the Insectivora, but really linking them with the Bats, and having also marsupial affinities. *Galeopithecus volans*, probably the only species, from the Indian Archipelago, is about 20 inches long, of lemur-like appearance, clothed in soft fur, dark coloured and mottled with white above, tawny grey below. It is nocturnal in habit, and the diet is chiefly vegetable, varied with insects and small birds. It climbs well, and passes from tree to tree by its "flying" apparatus, which consists of a patagium, to which are added antebrachial and interfemoral membranes as in the Bats (q.v.), and there are membranes between the digits. Wallace saw one glide through the air for about 70 yards. *G. philippinensis*, from the Philippines, is sometimes made a distinct species.

Flying Phalanger, a name for several small marsupials of the genus Petaurus, and allied genera or sub-genera, from New Guinea and Australia, differing little from the true phalangers, except in that they have a patagium (q.v.). The largest is about the size of a cat, and the smallest no bigger than a mouse. They are nocturnal in habit, and feed on fruit and insects. It is said that they have been seen to modify their course when in motion through the air. *P. australis* is the Yellow-bellied, and *P. sciureus* the Squirrel Flying Phalanger, and *P. pygmæus* is the Opossum, or Flying Mouse.

Flying Squirrel, a name for any squirrel having a patagium (q.v.). Of these there are three genera: (1) Anomalurus (often made a separate family, Anomaluridæ), with five species, from West Africa. There are peculiar plates on the under surface near the root of the tail, which evidently assist the animal in climbing; (2) Pteromys, with twelve species, ranging from the Western Himalayas to Java and Borneo, and containing the round-tailed flying squirrels; and (3) Sciopterurus, with about sixteen species from Northern Europe, Asia, and America, containing the flat-tailed flying squirrels. The Platouche (*S. volans*), about the size of a rat, is found in the north-east of Europe.

Focus, in *Physics*, is a point of concentration of waves of air, water, ether, or other medium capable of transmitting wave motion. The term is more exclusively applied to waves of light and heat, the familiar instance of the concentration of the sun's rays to a point by means of a burning-glass showing at once a focus of light and of heat. In optics a focus is *real* if the waves actually do reach the point; it is *virtual* if they only seem to proceed from or towards the point; it is a *principal* focus if it is the point to which plane-fronted waves may be directed by suitable reflection or refraction. An instrument for determining the positions of the principal foci of lenses is called a *focometer;* one for "focussing" or bringing the clearest image on the ground-glass of a photographic camera, is called a *focimeter*. The distance from a lens or mirror to its principal focus is called its *focal length*. In *geometry* the focus is a special point in relation to the conic sections, from which the distances of points on the curves may be conveniently measured.

Fodder, the food of domestic herbivorous animals, provided for them through human industry. In England the term is usually applied to dried vegetable produce, such as hay and straw. Domestic herbivorous quadrupeds obtain the chief part of their food from the grasses, which are eaten when fresh and green—Italian rye-grass, timothy, etc. Many of these grasses are artificial, and include such *Leguminosæ* as clover, vetches, lucerne, etc., which, when eaten green, are called forage-crops. Clover and cabbage are especially valuable. The winter food of these animals is furnished by dry fodder, roots, and seeds. *Dry fodder* consists of *straw*, the dried stems of cereals and leguminous plants; and *hay*, dried grasses which are grown especially for this purpose. Hay is more nutritious than straw, because it is cut while the plant is still young, and contains a large amount of sap. Some kinds of straw, however, especially pea-haulms and oat-straw, are little inferior to hay, if they are cut early and protected from wet. Hay is, to a large extent, composed of *leguminosæ*, as these are sown among the natural grasses, and cut and dried at the same time. The number and proportion of the ingredients is consequently very variable. The herbage of water-grass meadows is considered superior to that of dry meadows.

Fœtus, the name given to the mammalian embryo from the time when the changes which take place in the ovum after fertilisation have resulted in the formation of the rudiment of the offspring until birth. The human fœtus at the end of the first month of pregnancy is about one-third of an inch in length, the rudimentary eyes and ears are just distinguishable, and four bud-like processes represent the future limbs. By the end of the

third month the embryo exceeds three inches in length; the head is separated from the trunk by the formation of a distinct neck; ossification has commenced in most of the bones, and the placenta or after-birth, through which the fœtus is now to derive its nourishment, is already formed. By the end of the fifth month the fœtus weighs nine or ten ounces; the various features of the face have considerably approximated towards their ultimate shape, and fœtal movements can now be felt by the mother. By the end of the seventh month the fœtus has attained a length of some fifteen inches, and weighs about forty ounces. After this period the fœtus becomes *viable—i.e.* if born, it may possibly be reared. The fœtus at term averages about twenty inches in length, and weighs about seven pounds; the *fontanelles*, a large anterior and smaller posterior membranous interspace between the bones of the skull, are widely open; ossification is still very incomplete, too, in the bones of the limbs and trunk; the series of changes in the circulatory apparatus which adapt the child for the change from the fœtal circulation to that of the distinct individual, are now well-nigh complete, though the closure of the foramen ovale, which connects the two ventricles of the heart, and the complete degeneration of the fœtal structures known as the ductus arteriosus and ductus venosus, are not effected until a few days after birth. The peculiarities of the fœtal circulation cannot be discussed in detail here; suffice it to say that the pulmonary circulation is, of course, not yet established, and that aëration of the blood is effected in the placenta, while the structure of the fœtal heart is adapted to the special conditions for securing a flow of blood to the various parts which obtain.

Fog. 1. The formation of cloud from water-vapour in the air seems to require the presence of nuclei on which the particles may commence to aggregate. These nuclei are afforded by dust in the air, and the resulting cloud varies in appearance with the nature of these dust particles and the magnitude of the aggregations. Its deposition on the dust particles, like its deposition on the ground as dew, will depend on the amount of water-vapour that the air may possess and on the temperature of that layer of air. [Dew.] The cooling of warm air well laden with moisture and containing also a certain amount of dust, will generally cause the formation of cloud, mist, or fog, between which terms no definite distinction can be made. So long as the suspended globules of water remain very small they will be supported by air-resistance and carried about by air-currents; but if they unite and become enlarged they may become too heavy for suspension and fall as rain. Cold water may cool warm air down below the dew-point and so produce fog; this may be seen frequently on marshy land at evening, and is the cause of the coast-fogs of Nova Scotia and other parts. The blackness of London fogs is due to the smoky nature of the particles on which the water-vapour is deposited. The smoke particles are charged with heavy hydrocarbons, and become of a greasy consistency, when they accumulate moisture also. Such fog is highly injurious to animal life, and its prevention is in every way desirable. The simplest method seems to be to prevent the passage of smoke into the air. Smoke is fuel and should not be wasted; its loss in air is uneconomical, and is in the above indirect way dangerous. The aim, therefore, should be to render the carbon-combustion in all furnaces, fires, etc., as complete as possible, so that the products of combustion shall be gaseous and shall contain nothing of the ordinary smoke.

2. In photography, a dark stain which covers a negative, and which may be due to various causes, usually one of the following: over-exposure, use of too much alkali in the developer, a dirty negative plate, exposure to light before or during development. Stains on the plate due to use of a discoloured developer usually disappear during washing, but fog from either of the above causes remains more or less permanent.

Fog Signals, signals made during foggy weather to prevent collisions, shipwrecks, and other accidents. On board ships it is usual to ring the time-bell at short intervals, and to beat a gong, fire musketry, or produce some other striking sound. The use of such variable signs can but vaguely indicate the whereabouts or the course of a ship, and it has been proposed to adopt a general code for all classes of vessels like that employed in the British navy. Here a bell signifies that a ship is at anchor, and a long whistle repeated within two minutes that she is approaching under steam; while a single blast on the foghorn gives notice that she is sailing on the starboard tack, and two blasts together repeated within two minutes that she is on the port tack. For warning ships off a dangerous coast, foghorns and whistles are more efficacious than bells or guns, since a strong wind blowing landwards will prevent the latter from being heard at any distance from the shore. The most powerful foghorn is the "Siren." It is furnished with two discs, each containing twelve radial slits, one of which revolves in front of the other, where a large trumpet of cast iron is attached. The moving discs make 2,800 revolutions per minute, so that the slits are together 33,600 times every minute; on each occasion compressed air is made to pass through them, and afterwards reverberates through the trumpet, producing a powerful sound, sometimes audible at a distance of 10 miles. The fog-signals used on railways consist of detonating caps, which explode when an engine passes over them.

Foggia, a town of South Italy, and an important railway junction, in the province of the same name, 79 miles N.E. of Naples. It has regular streets of good houses, and among its public buildings are a cathedral, the governor's palace, and a theatre. It is the centre of a corn-growing district, and has extensive granaries beneath the streets. Its productions are cattle, capers, wine, and wool, and there is an important annual fair.

Foix, Counts of, were members of an old family of the south of France. The first was Roger, born in 1064. Another, Raymond, took part

in a crusade, and was with Philippe Auguste at the siege of Acre. His estates were afterwards forfeited for his siding with the Albigenses, and he died in 1223. Gaston III., called Phœbus on account of his manly beauty, was made governor of Languedoc and Gascony for his services to the king. Gaston IV. did good service for Charles VII. against the English. His grandson became Duc de Nemours (1505), and earned the epithet of "Thunderbolt of Italy." He beat the Swiss, chased the Papal troops, and seized Brescia from the Venetians, and won the battle of Ravenna against the Spaniards in 1512, paying for the victory with his life at the age of 23. The title then passed to the King of Navarre, and so eventually to the French Crown. Froissart tells us of the tragic accidental death of one of the family at the hands of his father.

Fokshani, a Wallachian town on the Miklov, on the border of Moldavia, 92 miles N.E. of Bucharest. It has a suburb in Moldavia on the left bank of the river. It was burnt in 1822 by the Turks, having been once before destroyed by the Russians in 1789.

Folcland, or FOLKLAND, in early English history, the public land of the nation, originally the remainder after provision had been made for each family and township. It was under the control of the king, subject to the counsel and consent of the Witan. Large grants of it were made in course of time, both to the monasteries and to the "new nobility" of thegns, and leases were granted which eventually gave rise to prescriptive rights over it. At the Norman Conquest it became the king's land, and was confounded with his private property. Its existence was doubtless a survival from the time when land was corporate property only, and the idea of individual ownership had not yet developed. There were analogies to it in early Germany, in mediæval Switzerland, in early Greece, and more particularly in the *ager publicus* at Rome. But in the continental states of early mediæval Europe it was not generally distinguished from the king's land.

Foley, JOHN HENRY, R.A. (1818–1874), a British sculptor, was born in Dublin. After obtaining several prizes at the Dublin Royal Society of Art, he came to London in 1834. He first exhibited in 1839, his earliest works being the *Death of Abel* and *Innocence*. He became A.R.A. in 1849, and R.A. in 1858. Among his many works are the group *Asia* and the statue of the Prince Consort on the Albert Memorial, the statues of Hampden and Selden in Westminster Palace, and those of General Outram in Waterloo Place and J. S. Mill on the Thames Embankment.

Foley, SIR THOMAS, naval officer, born in 1756, became a captain in 1790, commanded the *St. George*, 98, in Hotham's two actions in 1795, was flag-captain to Sir Charles Thompson in the *Britannia*, 100, at the battle of St. Vincent, led the fleet into action in the *Goliath*, 74, at the battle of the Nile, and was Nelson's flag-captain at Copenhagen. He became a rear-admiral in 1808, commander-in-chief in the Downs in 1811, a vice-admiral in 1812, and an admiral in 1825, and died rear-admiral of Great Britain and commander-in-chief at Portsmouth in 1833.

Folgore, of San Geminiano, an Italian poet of the 13th century. He wrote sonnets, which are valuable as throwing light upon his times. They have been translated by Dante Rossetti and J. A. Symonds, and contain much striking imagery. It has been said of them that "every line is a picture," and that every picture has the "charm of miniature upon a missal marge."

Folkestone, a seaport in Kent, 6 miles S.W. of Dover and 69 miles from London, is situated partly on the shore and partly on a cliff overlooking the sea, which has encroached at different times and swept away four out of the five original churches of the town. The one that is left has a central tower, and is conspicuous from its position on the cliff. There are a battery and three martello towers. The town is now a flourishing watering-place, and owes much of its prosperity to the fact of the South-Eastern Railway having made it the point of their cross-channel service to Boulogne. Folkestone was important in Roman and Saxon times, and suffered much from Danish inroads and French raids.

Folk-lore. Folk-lore is a modern and apt term adopted to designate the scientific study of popular antiquities. That there was anything of value in the traditions, suggestions, and customs of the people was hardly surmised till this century, when attention was drawn to them by the brothers Grimm—notably by the *Deutsche Mythologie* of Jakob Grimm, in 1835, which may be termed an epoch-making work, as it opened the eyes of men to the vast amount of material to be gleaned from the people which elucidates the ancient religious beliefs and customs of the race. Before this date the Grimms had published their collection of folk-tales, *Märchen*, in three volumes. The last volume was itself a revelation, as it showed how that a common stock of household tales was to be found widely dispersed through the Aryan race. The *Volkesmärchen* were published in 1812–1822, and the *Sagen* or collection of traditional tales in 1816–1818. In England, H. Bourne, in his *Antiquitates vulgares*, 1725, and J. Brand, in his *Popular Antiquities*, 1777, and Hone, in his *Every Day Book*, 1826, had collected much that was interesting; but no attempt was made in England to treat English folk-tales, superstitions, and legends in a scientific manner till Thomas Keightley took the matter up, and wrote his *Fairy Mythology* in 1828, and his *Tales and Popular Fictions* in 1834; both were written under the influence of the research of the brothers Grimm. "Folk-lore is often the only possible means of penetrating to the prehistoric past of nations, and it is certainly the only means of tracing out many of the landmarks in the mental development of man." By means of folk-lore we are able to explore extinct religions, cosmogonies, social organisation, of a time long past, and concerning which historians have left us hardly a word.

Folk-lore is divisible under five main heads—(1)

Superstitious beliefs and practices; (2) Traditional customs; (3) Traditional narratives; (4) Folk sayings, proverbs, etc.; (5) Folk music.

1. Under the first head are comprised all the superstitious usages or beliefs relative to natural objects, plants, and animals, the phenomena of earth, sea and sky; also all such as relate to the spirits of the dead and to supernatural beings, as fairies, dwarfs, and ghosts. Also beliefs having reference to witchcraft, divinations, the evil eye, things and seasons that are lucky or unlucky. It is found that the ancient deities of a race, or the deities of a conquered race, became the demons of the victorious religion and people. Thus Baal, the great god of the Canaanites, was regarded as Beelzebub, a demon, by the Jews. So also the Dusii of the Celts, woodland spirits, became to us the Dence. Bog, the Slavonic great god, is degraded into a Bogie. Uggr, one of the titles of Odin or Woden, the over-lord of the Norse and Teutonic peoples, has sunk to be the Ogre of nursery tales. Skrati, a forest hairy spirit, is now Old Scratch—the Devil. Consequently, by a study of superstitious beliefs and practices, we are able in part to reconstruct the religion of our forefathers before St. Augustine landed in Kent.

2. Traditional customs represent not only the ritual of a displaced religion, but reveal to us many of the social usages of a condition when civilisation was only dawning. Thus the casting of an old shoe after a bride is a reminiscence of the time when the authority for life and death over the woman was made over by the father to the husband; and the salutation by raising or touching the hat is a far-off reminiscence of the period when no man but the chief could have his head covered, and the bared head was an acknowledgment of feudal dependence.

3. Traditional narratives in prose or verse are of the highest importance. They comprise nursery tales, historic legends, stories attaching to places and families, also ballads.

Some of the household tales enable us to reconstruct the mythology of lost religions; others elucidate early customs. For instance, in folk-tales the youngest son is usually the successful one of the family, and this points to the period when the family estate and house went, as it still does in the Black Forest in Germany, not to the eldest, but to the youngest son. [Borough English.]

Children's games are also of much more importance than could have been supposed; they often are an after-glow of lost religious ceremonials.

4. Folk sayings and proverbs reveal to us the powers of observation of nature among those living in the country, also give the measure of their experience of life and their solution of its mysteries.

5. Lastly, folk music is deserving of collection, as it furnishes us with much fresh and fine melody, often set in ancient *modes*, in which no music has been composed for over a century, perhaps two. As the modern ear is accustomed to music in one of the eight modes only, it cannot understand and appreciate music which does not belong to the modern conventional form; but much of the ancient music of Europe was composed in the seven other modes, and was not committed to writing, unless it were ecclesiastical. Consequently, it can only be recovered traditionally. None of it goes back, indeed, to prehistoric times, but a good deal dates from before the reign of Henry VIII. Scotland is justly proud of its magnificent store of ballad poetry. This treasure was at one time diffused over all England as well, but was never collected in England from the people, as it was in Scotland, by Herd, Motherwell, Scott, etc. All our collectors went to printed broadsides—comparatively recent compositions; it never occurred to them to go to the people; consequently we in England have not more to show than a few specimens of what was once as rich a growth among our people as in Scotland.

For the collection of popular antiquities accuracy is essential; and no better guide can be recommended than *The Handbook of Folk-lore*, edited by Mr. Gomme, for the Folk-lore Society (published by Nutt, London, 1890). Many a well-intentioned work on traditions and folk-tales has been rendered worthless by unscientific treatment, or through inaccuracy in the taking down of particulars.

An admirable scheme of analysis of folk-tales was proposed by Hahn in his *Griechische u. Albanesische Märchen* (1864), in which he showed how all such stories could be reduced to skeletons, and then grouped.

Folkmoot (Meeting of the People) is the old English name for the great assembly of the nation for political and judicial purposes. It answers to the Campus Martius or Madius of the Franks, the Swedish Ting, and the Icelandic Althing. It differed from the Witenagemot (q.v.) in being composed of all freemen, and not of the great men alone. There was never a Folkmoot of all England, but only of the separate kingdoms. The Shiremoot, however, was a complete folkmoot for the district comprised in the shire.

Follicle, a dry, many-seeded, one-chambered carpel which splits, when ripe, down one suture, generally the ventral suture. This latter character alone differentiates it from the legume (q.v.), which splits down both sutures. A single follicle seldom forms a fruit by itself, though it does so in some species of larkspur (Delphinium). More commonly two, three, five, or more, occur in a ring, as in the peony, most larkspurs, columbines, aconites, hellebores, and marsh marigolds (*Caltha*), and in the flowering-rush (*Butomus*); or a still greater number may occur arranged spirally in an etærio (q.v.), as in *Magnolia*. [Fruit.]

Fomentation, the application of flannel wrung out of hot water to a painful part is at times attended with considerable relief. Various drugs which contain sedative ingredients (poppy heads, turpentine, etc.) may be added to the water, though doubtless the main point to be attended to is the warmth. The fomentation should be as hot as can be borne with comfort by the patient.

Fonblanque, Albany William (1797–1872), an English journalist, was educated for the bar, but took to journalism and joined the *Morning Chronicle*, and afterwards became leader-writer,

editor, and proprietor of the *Examiner*. In 1852 Lord John Russell made him head of the Statistical Department of the Board of Trade, and from that time his connection with journalism almost ceased. In 1837 he published *England under Seven Administrations*.

Font, the receptacle of the baptismal water in churches, usually consists of a basin hollowed out of a solid block, and supported upon a pedestal. It is now generally about $2\frac{1}{2}$ feet in diameter, but was formerly large enough to hold the body of the child, who was immersed. Most fonts are of stone, but ancient leaden ones are to be seen. They are generally placed at the western end of the church, but sometimes stand in a separate chapel. Anciently the font was in the baptistery of the Cathedral Church only. It is so still in some of the cities of Italy. Fonts in almost every style of architecture exist in England. A fine example of the Decorated is in the church of All Saints, Norwich; and of the Perpendicular there is a perfect specimen at St. Nicholas, East Dereham, Norfolk.

Fontainebleau, a town in the French department of Seine-et-Marne, in the middle of a forest of the same name, 2 miles from the Seine and 37 miles S.E. of Paris. The town is well-paved and has good streets, and has among its public buildings good barracks, a library, a college, public baths, and hospitals. There are sandstone quarries much used for paving purposes, and manufactures of calico, porcelain, and stoneware. The palace, which stands in a beautiful park, and is surrounded by 85 square miles of forest, was a royal residence as early as the 12th century. Henri IV., Louis XIV., Napoleon, and Louis Philippe spent much money upon beautifying it; and it was here that Napoleon signed his act of abdication in 1814.

Fontanes, Louis, Marquis de (1757–1821), a French poet and politician, was born at Poitou. He went to Paris in 1777, and the next year produced *La Forêt de Navarre*. Other works of his were *Cri de mon Cœur*, *Le Jour des Morts à la Campagne*, *Le Verger*, *La Chartreuse de Paris*, and a translation of Pope's *Essay on Man*, accompanied by an introduction. At the Revolution he became a journalist, and went to Lyons and other places. At first he was in favour with the authorities, but was afterwards forced to take refuge in England. He wrote an *éloge* on Washington for Napoleon, at whose fall he joined the king's side and was made a peer, and received other honours. His works were edited by Sainte-Beuve in 1837.

Fontenelle, Bernard le Bovier de (1657–1757), a French centenarian and writer, was born at Rouen. He was so delicate in childhood that it was considered impossible that he should grow up. His mother was a sister of Corneille (q.v.). Fontenelle was educated at the Jesuit College at Rouen, and became an advocate, but soon abandoned law. In 1674 he came to Paris, and attracted notice by his poems and other writings. He collaborated in some operas, and in 1681 produced a tragedy, *Aspar*, which was a failure. In 1683 appeared his *Dialogues of the Dead*, and in 1686 his *Entretiens sur la pluralité des Mondes*. He also wrote many *Eloges*.

Fontenoy, a village of the Netherlands in Hainault, noted as the scene of a French victory gained on May 11, 1745, by Marshal Saxe, over an allied army of British, Austrians, and Dutch.

Fontevrault, a French commune in the department of Maine-et-Loire. It is situated in the middle of a forest in a valley 10 miles S.E. of Saumur. A Benedictine abbey was founded here in 1099, and was notable as containing both monks and nuns, the Abbess being the head of the whole in honour of our Lady. The duties were divided between the sexes on the old principle that Adam should delve and Eve spin. The abbey had many dependencies, there being thirty of them in Brittany alone. The last Abbess was a niece of Madame de Montespan. Henry II. and his wife Eleanor, Richard I., and the wife of King John are English sovereigns buried here.

Foochow, capital of the province of Fokien in China. It is situated on a hill-surrounded plain on the left bank of the Min, 125 miles N.E. of Amoy. The town proper is contained by a wall 30 feet high and 12 feet wide, with seven gates with towers, and there are suburbs on both sides of the river connected by a stone bridge. The streets are dirty, and there are several temples. Foochow is one of the five treaty ports created in 1843, but the navigation is difficult. The exports are tea, timber, tobacco, bamboo, fruits, potash, and paper; the imports opium, lead, cottons, and woollens.

Food. The term "food" is usually applied to the various substances taken into the body through the mouth, which serve to counterbalance the waste of the tissues. In a general survey of the substances which enter the body, air would necessarily be included, and the oxygen of the air has every claim to be considered a food. In the present article, however, the term "food" will be limited to the solid and liquid substances which enter the body through the alimentary canal. On the supposition that the weight of the body remains constant, it is only necessary to know accurately the amount of the several chemical elements contained in the excreta, to estimate the quantities of these elements which must be taken into the body to replenish waste. It must, of course, be borne in mind that any given element may be eliminated in various ways, and in striking a balance between the substances taken in and the substances eliminated it must not be forgotten to include in the former both what enters by the lungs and by the stomach, and in the latter not only what is discharged from the alimentary canal, in the urine, and from the skin, but also what is exhaled in the expired air. Again, the food is the great source from which the body derives its energy, and the chemical composition of substances excreted differs markedly from that of substances ingested; in fact, in correspondence with the energy imparted by the food to the body, it is found that the excreta are composed of substances representing but little work-

producing capacity, while the ingesta are made up of substances possessed of considerable potential energy. The various food stuffs may be divided into two great classes:—*Organic* and *inorganic*, the former comprising (1) nitrogenous foods (proteids and their allies), and (2) non-nitrogenous foods (sugars, starches, and fats). The inorganic foods consist of mineral salts and water. (For the composition of proteids, fats, sugars, and starches, *see* DIGESTION.) To come now to the principal forms in which the various food stuffs occur. Lean meat contains from 15 to 20 per cent., milk upwards of 4 per cent., white of egg upwards of 20 per cent., peas, beans, etc., upwards of 25 per cent., wheat flour upwards of 10 per cent., and cheese from about 30 to 40 per cent. of *nitrogenous substances*. *Fats* occur in the fat of meat, in butter, lard, suet, and the various oils. *Starches* enter largely into the composition of most vegetables, especially potatoes, and constitute nearly half the weight of bread. *Sugars* are widely distributed, being especially prominent constituents of fruit and vegetables, and forming 5 per cent. by weight of milk. *Mineral salts* enter more or less largely into the constitution of all foods (nearly 2 per cent. in flour, nearly 1 per cent. in milk, 4 or 5 per cent. in flesh). Green vegetables and fruit supply certain salts not readily obtained from other articles of food, and the health of the body seems to suffer if they are entirely excluded from the diet list. A reference to the chemical constitution of the chief food stuffs will show that the elements which enter most largely into their composition are carbon, oxygen, and nitrogen. Oxygen is obtained, of course, in large quantities from the air. It may be well to consider the relative proportions in which the two remaining elements should exist in foods. In order to counterbalance the waste occurring in an ordinary healthy adult, it is necessary to supply daily about 4,500 grains of carbon and nearly 300 grains of nitrogen. Now in proteid foods there are from three to four times as much carbon as nitrogen, while starches, sugars, and fats contain no nitrogen at all. The necessity for a mixed diet thus becomes apparent; for if an individual were restricted to proteid food, he would clearly have to consume a large excess of nitrogen if he is to obtain the necessary amount of carbon, while, on the other hand, it is manifest that no amount of starches, sugars, or fats would supply him with the required amount of nitrogen. The proportions of the various food stuffs which exist in milk are such as to exactly meet the requirements of the infant in respect of carbon and nitrogen, and for this reason milk is sometimes spoken of as a "perfect food." Much has been written concerning the several parts played in the animal economy by the various food stuffs. It is clear that fats are in the main heat producers; hence the large share they occupy in the diet of the inhabitants of cold countries. The starches and sugars seem to be in part converted in the body into fat. The changes which the proteids undergo are very complex; they appear to be essential to tissue formation. The mineral salts must enter into the composition of the diet in a certain proportion for the maintenance of health. The amounts of the several food stuffs, which should be comprised in the diet of a healthy adult taking moderate exercise, are:—Nitrogenous substances, about 5 oz.; fats, about 3 oz.; starches, about 15 oz.; salts, a little more than 1 oz. These figures represent weights of water-free food stuffs; in practice these food stuffs are met with combined with 50 or 60 per cent. of water, for which allowance may be made. In addition to the water which is contained in ordinary solid food, some three pints of liquid will be required *per diem*.

Fools, THE FEAST OF, was a mediæval semi-Christian survival of the Pagan Saturnalia of ancient Rome. The Church authorities at first strenuously opposed it, but with so little success that the observance came to have something of a religious character. Thus, the scene of action was generally a church, in which the travesty of an election of a Pope, cardinal, or other ecclesiastical dignity. calling himself "Pope of Fools," "Boy Bishop," "Abbot of Unreason," or the like, would take place. Sometimes even a mock celebration of the mass was enacted; and sometimes an ass would be led up to the altar to the strains of a hymn. In this case the name "Feast of Asses" was given to the grotesque proceedings. The Reformation, it would be thought, would have made short work of such observances, but at Antibes, near Nice, the Feast of Fools was observed so late as the year 1644. The authority on the subject is Du Tillist: *Mémoires pour servir à l'histoire de la Fête des Foux*, 1741.

Foot. 1. The bones of the foot may be divided into three groups—viz. *Tarsus*, *Metatarsus*, and *Phalanges*. The bones of the *tarsus* are seven in number—viz. the astragalus, os calcis, cuboid, scaphoid, and the three cuneiform bones (internal, middle, and external). The astragalus articulates with the tibia above, entering into the formation of the ankle joint; it rests upon the os calcis below, and articulates with the scaphoid in front. The os calcis forms the bony prominence of the heel. The cuboid is situated in front of the os calcis on the outer side of the foot, and articulates anteriorly with the fourth and fifth metatarsal bones, and internally with the external cuneiform bone. In front of the scaphoid on the inner side of the foot is the internal cuneiform bone; just external to it is the middle, and outside this again is the external cuneiform bone. In front of the tarsus is the *metatarsus*, consisting of five bones: the three internal metatarsal bones articulating with the cuneiform bones, and

BONES OF FOOT.

a, Os calcis; *b*, astragalus; *c*, scaphoid; *d*, cuboid; *e f g*, cuneiform bones; *h*, metatarsus; *i*, phalanges.

the two external metatarsal bones articulating as aforesaid with the cuboid. Anteriorly to the metatarsal bones are the *phalanges*, numbering fourteen bones in all, two for the great toe and three for each of the other toes. The bones of the foot are united one to another by strong ligaments, and these ligaments, together with the tendons of muscles which are attached to the bones, serve to maintain the shape of the foot. An examination of an antero-posterior section of a foot shows that the weight of the body, transmitted through the astragalus, is borne by an arch, the hinder portion of which is formed by the os calcis, while the front portion terminates in the balls of the toes. This arch is called the plantar arch. The weakest point in the mechanism of this arch is found to be just below the anterior portion or head of the astragalus. This portion of bone rests upon a ligament which unites the scaphoid with the os calcis, and is further strengthened by the tendon of the posterior tibial muscle (a muscle which winds round the os calcis and passes forward to be inserted into the scaphoid). If the arch gives at all at this point the condition known as *flat-foot* results. The groups of muscles which act upon the foot may be briefly alluded to. The calf muscles act through their tendon (the tendo Achillis) upon the prominence of the os calcis, and when they contract the heel is raised and the toes are brought more or less into line with the lower leg. The muscles which are situated in front of the lower leg, acting through their tendons, elevate, on the other hand, the front of the foot. Thus flexion and extension at the ankle joint are effected, the former being brought about by the muscles of the front of the leg, the latter by the calf muscles. The peronei muscles rotate the foot outwards (abduction), while the tibialis anticus and tibialis posticus rotate it inwards (adduction). The toes are flexed by muscles and tendons running through the sole of the foot, and extended by muscles coursing over the back or dorsum of the foot. It so happens, then, that flexion at the ankle joint and extension of the toes are associated actions, in part brought about by identical muscles situated in the front of the leg, and running over the dorsum of the foot; while similarly extension at the ankle joint and flexion of the toes are effected by muscles situated at the back of the leg and lying beneath (*i.e.* in the sole of) the foot. Beneath the skin of the sole, which is thick and resistant, is a padding of fat, and underneath this again is a strong fascia, the plantar fascia.

2. The foot is the ordinary English unit of length. It is one-third of the standard *yard*, and was taken originally from the length of the human foot. Similarly the French have a unit they call the *pied usuel*, which is a third of the standard *mètre*. This is distinct from the Paris foot, which is about one per cent. smaller. The English foot is divided into 12 inches, and each of these into 12 lines.

Paris foot	=	12·78912 English inches.
Rhenish foot	=	12·35652 ,,

Foot and Mouth Disease, an infectious disease common in cattle and in rare instances occurring in man. As the name implies, its most marked symptoms are developed in the neighbourhood of the mouth and feet, where a vesicular eruption manifests itself. On the mucous membrane of the lips and gums, on the tongue, in the interspaces of the front of the foot, and on the udder in cows, little blebs appear. There is some fever and constitutional disturbance, which last for a week or ten days. The disease is one of those within the scope of the Contagious Diseases (Animals) Acts.

Foot Rot, a disease occurring in sheep.

Football, the national winter pastime of England, is an outdoor game, which at the present time may be said to be very nearly, if not quite, the most popular game played. The game has of recent years been divided into two great camps of players, each owing allegiance to two different codes of laws—viz. those of the Rugby Union and those of the Football Association. The chief point of difference is, that in the former game the ball may be picked up and run with at any time, while in the latter no handling of the ball whatever is allowed, and the whole of the work has to be done with the feet.

Under the Rugby Union laws fifteen players on each side take part in the game, distributed as follows: one full back, three three-quarter backs, two half-backs, and nine forwards. The field of play should be 110 yards long and 75 yards broad. At each end are placed two goal posts 18 ft. 6 in. apart, joined by a crossbar 10 feet from the ground, and the object of each side is to kick the ball over this bar of their opponents' goal. The field of play is marked round with a chalk line. When the ball goes over the side lines, called the *touch* lines, it is out of play, and has to be thrown into play at right angles from the touch lines and parallel to the goal lines. A *try* is gained when a player touches the ball down behind his opponents' goal lines. The ball is then brought out straight by a player of the side gaining such *try*, and being placed on the ground, a kick at goal is taken. Should the ball go over the crossbar it counts a goal, and the ball is then kicked off again from the centre of the ground. A player is *offside* when the ball has been kicked by one of his own side who is at the time behind him, and he may not then touch the ball or in any way interrupt or impede any opposing player till he is again on side. A *scrummage* takes place when a player holding the ball in the field of play is *collared* or held. He then has to put it down on the ground in front of him, and all who have closed round on their respective sides endeavour to push their opponents back, and by kicking the ball, or by passing it back to their own side, to kick or carry it in the direction of their opponents' goal. A *drop-kick* is made by letting the ball fall from the hands and kicking it the *very instant* it rises. A goal may be obtained by any kind of kick except a *punt*, which latter is made by letting the ball fall from the hands and kicking it *before* it touches the ground.

If a player wilfully breaks any of the rules of the game, or in the opinion of the referee is guilty

of unfair play, a free kick is awarded to the opposite side.

A match is won by a majority of points. A goal kicked from a try equals 5 points (including the value of the try), a try 2 points. A goal from a drop-kick, or from any other kick except a punt, 4 points, and a penalty goal 3 points. The ball played with is of oval shape, and is made of an inflated bladder covered with leather.

Under the Association laws eleven players a side take part in the game, the disposition in the field of such players being one goal-keeper, two full-backs, three half-backs, and five forwards, two playing on the left wing, two on the right wing, and one in the centre. The limits of the ground vary from a maximum of 200 yards long by 100 broad to half this distance. The goal posts are 8 yards apart with a bar across them 8 feet from the ground. The ball is round, the circumference being 27 to 28 inches, and the weight 13 to 15 ounces. The rules are much simpler than those of the Rugby Union game, the sole object being to kick the ball between the opponents' goal posts and *under* the bar.

The game is started by a kick from the centre of the ground, the opponents' forwards standing 10 yards back from the ball, till it is so kicked off. If the ball crosses the side touch lines it is out of play, and must be thrown into the field of play by a player of the opposite side to that which kicked it out. The thrower has to face the field of play and throw it over his head with both hands in any direction. With the exception of the goal-keeper no player is allowed to carry, knock, or handle the ball under any pretence whatever. Should he do so, a free kick is allowed against him.

When a player kicks the ball, or throws it in, from touch, any one of the same side who is then nearer to the opponents' goal-line may not touch the ball, or in any way hamper his opponents, until the ball has been played, unless there are at such moment of kicking or throwing at least three of his opponents nearer their own goal-line. A *corner kick* is when the ball has been sent behind their own goal-line by one of the defending side, in which case one of the opposing players shall kick it from one yard of the nearest corner flag-post. Such player endeavours to kick it as near the mouth of his opponents' goal as he can, the other players of his side attempting to rush it between the posts.

Football, generally, is of very ancient origin, and mention is found of it as far back as the reign of Edward II. It was then played in a very rough and primitive fashion by large groups of men, the goals being often some miles apart. Shrove Tuesday appears to have been the great day for these games, and the games played at Chester, Corfe Castle, Scone, and Derby are historical. Many Acts were passed in the reigns of Edward III., Richard II., Henry IV., and Henry VIII., with a view to stamping out the sport; but these appear to have been quite ineffectual, and the game flourished generally in the sixteenth century. Several allusions to the game are to be found in Shakespeare. Tripping, hacking, and rough play of every description was then allowed, and the game got a very bad name—a character which it has not even yet quite shaken off. The modern Rugby Union game came in its present form from Rugby School, although even the laws there have been very considerably modified. The Rugby Union was started in 1871, and since its institution has done extremely good work in expunging the rules of the game which led to roughness and brute force and changing it into what it now is—a really healthy and scientific pastime.

The Football Association was started in 1863. This branch of the game takes its origin almost entirely from the public schools of Eton, Harrow, Westminster, Winchester, and Charterhouse. The scientific nature of the game has been largely elaborated of late years, and the play of the powerful professional teams of the north attracts enormous crowds, and awakens the most intense excitement and enthusiasm. In fact, football in the north of England and in Scotland may be said to be now the most popular game played.

Foote, SAMUEL (1720–1777), an English actor and dramatist, was born at Truro. He was educated at Worcester, and afterwards proceeded to Worcester College, Oxford; but, displaying there the same extravagance that marked him through life, and seems to have been hereditary, he left without a degree. He entered at the Temple, and after getting through a fortune took to the stage, where his first appearance was a failure. His further efforts as a light comedian and buffoon in a kind of society entertainment were successful. He had great powers of mimicry. Having inherited and dissipated a second fortune he went to Paris, but after two years was back in London, writing. In 1766 he lost his leg partly owing to a kind of practical joke of the Duke of York and others, and this misfortune was to his advantage, for the Duke of York obtained a valuable acting patent for him. He satirised Garrick and Johnson among others, and eventually his satire of a man named Jackson led to his being charged, by way of vengeance, with a criminal offence. He was acquitted, but the accusation broke him down, and he was starting for France in search of health, when he died at Dover. He is buried in the cloister of Westminster Abbey. His plays are now for the most part forgotten.

Footmen, a series of about a dozen species of English moths belonging to the family *Lithosiidæ;* the larvæ mostly live on lichens. The moths are small and of a dull colour; when captured they simulate death.

Foot-pound is the English engineer's unit of work or of energy. It is equal to the amount of work done when one pound mass is lifted vertically against gravity through a distance of one foot, or when a force equal to one-pound weight is exerted in any direction through one foot. Inasmuch as the force of one-pound weight varies in different localities on the earth's surface, the foot-pound is not an absolute or fixed unit. The absolute unit of work is the foot-poundal, representing the work

done in exerting one poundal of force through a distance one foot; the poundal is independent of position, and the unit is thus absolute. The corresponding unit of work, when the centimètre-gramme-second system is taken, is called the *erg* (q.v.), and is the work done by a dyne force moving through one centimètre distance. [DYNE.] One erg is equivalent to ·000002373 of a foot-poundal, and is, as a rule, inconveniently small. [ENERGY, WORK.]

Foraminifera, a group of Rhizopoda (q.v.) in which the body is protected by a shell or "test," through openings in which numerous fine filaments (pseudopodia) are emitted. The shell is composed either of carbonate of lime, silica, chitin, or grains of sand cemented together by the same chitinous or horny substance. The openings through the shell are either minute and numerous or larger and confined to one particular area or mouth; the pseudopodia are long, and interlace to form a network around the test, which is often completely covered by a layer, formed by the fusion of the bases of the pseudopodia. The protoplasm is uniform and is not differentiated into ectoplasm and endoplasm, as in the *Amœba* (q.v.). A nucleus is, of course, present, and is at first always single: when reproduction is about to take place it subdivides. The shell is the most important structure in the group, and the various classifications proposed have been based upon it. Of these, the most important was one that divided the foraminifera into two groups; the Perforata, and the Imperforata. The former included all those forms in which the test is perforated by numerous minute pores and of which the substance appeared hyaline or glassy. The Imperforata included those in which the shell substance is chitinous, porcellanous or composed of sand grains, and which is not penetrated by pores, the pseudopodia all issuing at the mouth. It has, however, now been found that such an arrangement is quite artificial, and perforate and imperforate forms are now included in the same family, as in the *Lituolidæ*. The test may be simple as in *Orbulina*, or composed of many simple chambers united into a single (polythalamic) individual as *Globigerina*. In many of the complex forms, such as the Nummulites, the separate chambers are separated by an "intermediate skeleton" through which a "canal system" ramifies, and across which various "stolen passages" maintain the connection between the chambers. Most of the Foraminifera have either a straight, coiled, spiral, crozier, or disc-shaped test, but in the arenaceous forms it is often very irregular; thus in the recent *Hyperammina* it is tubular, and in the allied fossil *Girvanella* it is a much-coiled tube. With very rare exceptions, the Foraminifera are all marine; they are universally distributed through the oceans, living on the surface or at great depths. Their tests accumulate at the bottom as a chalky ooze which covers great tracts of the ocean floor at depths of from 250 to 3,000 fathoms. As rock-builders they have played an equally important part in the past, as *Fusulina* in the Carboniferous period, *Globigerina*, etc., in the chalk and *Nummulites* in the Eocene have helped to build up great sheets of limestone. The earliest known fossil form occurs in the Ordovician. *Eozoon* (q.v.) was once regarded as an earlier representative of the group, but the theory of its organic origin is now discredited.

Forbes, ALEXANDER PENROSE (1817–1875), was born at Edinburgh, and educated partly at Edinburgh Academy, partly under a private tutor. He entered at Haileybury with a view to preparing for the Indian Civil Service, and proceeded in due course to Madras, but ill-health compelled his return to England. He then entered at Brasenose College, Oxford, and in 1841 obtained the Boden scholarship for Sanskrit. He graduated in 1844, and came under the influence of the High Church movement. He was ordained, and, after serving as curate, was made vicar of St. Saviour's, Leeds, in 1846. In 1847 he became Bishop of Brechin, and ten years later he was proceeded against, and "censured and admonished" for his advanced doctrinal views. He wrote upon the Nicene Creed, the Thirty-nine Articles, and other theological subjects.

Forbes, DUNCAN (1685–1747), was born at or near Culloden, and was educated at Edinburgh and at the University of Leyden. In 1709 he was admitted advocate, and in 1715 exerted himself in the Hanoverian interest. In 1722 he was M.P. for Inverness, in 1725 Lord Advocate, and in 1737 was made Lord President of the Court of Session. He took an active part in the politics of his country, and made strong efforts on behalf of Edinburgh when her privileges were threatened on account of the Porteous riots. In the rising of 1745 he was influential in keeping some of the clans from joining in the movement, and was pointed out by Lord Lovat to Charles Edward as a formidable foe, and he was obliged to take shelter in Skye upon the Prince's advance. His efforts on the side of the Government were hardly appreciated, and money he raised for it is said never to have been returned. He had advised the Government to embody the clans as regiments, but the idea was not adopted till later. He left some writings and correspondence.

Forbes, EDWARD (1815–1854), a naturalist and F.R.S., was born at Douglas in the Isle of Man. As a child he used to make collections in botany and the like. In 1831 he came to London with the idea of adopting painting as a profession, but soon abandoned it and entered as a student of medicine at Edinburgh. From 1833–35 he travelled in Norway, the Isle of Man, Wales, France, Germany, and Switzerland, making scientific researches, and in 1836 attended lectures at the Jardin des Plantes, Paris, and then went to Algiers to study molluscs. In 1838 he travelled in Styria and Carniola; and shortly afterwards lectured in Edinburgh on the natural history of the animals of the British seas. In 1841 he published a *History of British Starfishes*, and the same year he embarked on H.M.S. *Beacon* to explore the botany, zoology, and geology of the

Mediterranean. In 1851 he became Professor of Natural History at the Royal School of Mines in Jermyn Street, and in 1854 was made Professor of Natural History in Edinburgh University.

Forbes, JAMES DAVID (1809–1868), was born in Edinburgh. He was intended by his father, Sir William Forbes, for the bar. His own bent, however, was towards physics, astronomy, and meteorology, and after going to Edinburgh in 1825, he sent a paper upon the *Apparent Number of the Stars* to the *Edinburgh Philosophical Journal*. He made a tour through France, Germany, and Italy, and wrote upon the things he saw. He returned to Edinburgh, and studied moral and natural philosophy, and became F.R.S. of Edinburgh at nineteen. He finally took up Natural Science as his subject, and was much with Sir David Brewster, whom he aided in founding the British Association. In 1833 he was appointed Professor of Natural Philosophy in Edinburgh, and besides filling this post well, he did much for the advancement of the university by introducing the practice of examining for degrees. In 1859 he became Principal of the University of St. Andrews. Besides numerous papers and memoirs on many subjects, he published a *Theory of Glaciers*, *Travels through the Alps of Savoy*, a *Tour in Mont Blanc and Monte Rosa*, *Norway and its Glaciers*, and made many valuable researches into the nature and action of heat.

Forbes, SIR JOHN (1787–1861), was a Scottish physician, born in Banffshire, and educated at Aberdeen and Edinburgh. From 1807–16 he was an assistant-surgeon in the navy, and then graduated at Edinburgh, and lived successively at Penzance, Chichester, and London. He studied and wrote on meteorology and geology, translated a work on auscultation, and introduced the use of the stethoscope, and in 1832–35 collaborated in the *Cyclopædia of Practical Medicine*, besides writing *A Physician's Holiday*. In 1840 he took part in conducting the *Medical Quarterly Review*, retiring in 1859, and eventually dying at Whitchurch. He became F.R.C.P. in 1845, in 1852 honorary D.C.L., and was knighted in 1853.

Forbidden Fruit, a popular name for various fruits belonging to the genus *Citrus*. In the London markets the name is applied to *C. Paradisi*, a small-fruited, smooth-skinned variety of the shaddock, *C. decumana*, also known as "pomelo." In Paris the name, or rather its equivalent, "Pomme d'Adam," belongs to the sweet-skinned orange, a variety of *C. Aurantium*. Italians apply the name "Pomo d'Adamo" to a form of the lime, *C. Limetta*.

Force is that which changes the motion of a body. The study of forces is called *dynamics* (q.v.), and is necessarily very extensive on account of the variety of bodies existent in the universe, and the number of combinations that applied forces can effect in acting thereon. It is usual to add to the definition "*that which tends to change* the motion of a body," for convenience in distinguishing between force-combinations that change the motion and those that balance each other and produce no resultant motion; but the application of a single extra force to any system in equilibrium will necessarily disturb that equilibrium, and if a case occur where the extra force brings about a state of balance, the previous condition of the system could not have been one of equilibrium. In other words, a single force must change the state of motion; it cannot merely tend to change that state. A force is measured by the rate at which it can change the amount of motion in a system; otherwise expressed, it is measured by the time-rate of change of momentum. Units of force are so chosen in accordance with this principle; the English *poundal* will give to any mass in one second the momentum possessed by one pound mass moving with a speed of one foot per second; the *dyne* will similarly give in one second the momentum of one gramme mass moving with one centimètre per second speed. English engineers prefer to use the weight of one pound as their unit of force, but it has the disadvantage of varying slightly at different parts of the earth's surface. The exertion of force to produce motion of any body means an expenditure of energy, which is measured by the product of the force and the distance through which it acts. This could be regarded as the fundamental principle for the measurement of force—estimating it as the space-rate of change of energy. Force is not a scalar quality; it is not completely defined by its magnitude, but requires also the statement of its direction, sense, and position. Such quantities are called *rotors* (q.v.), and the laws for their addition, etc., which are studied in quaternions, may be applied to the special case of forces. The application of a force to a given mass must be by means of other matter, though the two substances so involved may not be in actual contact. Newton's third law of motion shows that the action between the two is mutual, that the first body exerts a force on the second that is exactly equal to the force exerted by the second on the first. It is obvious that the duration of application of each of these forces is the same, and that they are opposite in sense. So that the momenta produced by each are equal in magnitude but opposite in sense, and, in fact, their interaction only signifies a redistribution of the same total momentum in the system. That two bodies remote from each other can interchange momentum is a remarkable fact, illustrated readily in the case of gravitation, and demands the existence of some medium between them.

Force-polygon, in graphical statics, means a polygon drawn to scale such that its sides, taken concurrently, represent a set of forces in magnitude, direction, and sense. The forces being in equilibrium, it will be found that the polygon so drawn will be closed, *i.e.* the application of the last line to the figure, representing the last force in magnitude, direction, and sense, will completely close the figure. If the figure remains open, the forces will not be in equilibrium, but on addition to the system of a force represented to the same scale by the line joining the last point of the diagram to the first, balance may be made to obtain.

Forceps. There are several forms of instrument, with widely different uses, employed in medical

practice to which the term forceps is applied. A few of these may be alluded to. For instance, the *extraction forceps* of the dentist are of varying shapes, in accordance with the particular tooth for which each is designed; *pressure forceps* are employed in controlling bleeding by being applied so as to compress the tissues, as they are divided by the knife, in the performance of operations; *bone forceps* are furnished with cutting edges and modelled so as to afford considerable leverage, adapting them for dividing bone; again, there are forceps shaped so as to be used for passing through the nasal passages and into the pharynx, *laryngeal forceps*, *tracheotomy forceps*, and many others. *Midwifery forceps*, which are employed to facilitate the delivery of the head of the child in cases of difficult labour, were first invented by Paul Chamberlen in the 17th century. The discovery was kept a secret for many years—indeed, even in the middle of last century knowledge concerning the new method was confined to a few, and was jealously guarded by them. The construction of the midwifery forceps has been considerably improved during the present century, and great advances have been made in the science of their application.

Forcible Entry. This is a criminal offence, and consists of an entry or detainer made with such a number of persons or with such apparent force as is calculated to deter the rightful owner from sending the persons away and resuming possession. The offence exceeds a trespass. The entry must, however, have been unlawful to constitute it a criminal offence.

Forcite, a high explosive, is a mixture of nitroglycerine and cellulose, the latter being first gelatinised by being heated in water under considerable pressure. It is, practically, gelatine dynamite. It is the invention of a Swedish captain, J. M. Lewin.

Ford, JOHN, an English dramatist, was born in North Devon in 1586. He entered at the Middle Temple in 1602; and in 1606 his first work, *Fame's Memorial*, appeared. Besides collaborating in the *Sun's Darling* and other pieces, such as *The Witch of Edmonton* and *The Bristowe Merchant*, he wrote *Lover's Melancholy* (1628), *Lady's Trial* (1638), *Broken Heart*, *Love's Sacrifice*, and *Perkin Warbeck*. Though often morbid in his choice and treatment of subjects, Ford was a powerful dramatist.

Fordun, JOHN OF, was a Scottish chronicler of the 14th century, and was a secular priest and canon of Aberdeen. He is said to have travelled on foot in England, Scotland, and Ireland to gather material for his work. The five books which he published of the *Scotichronicon* go down to the death of David I. in 1153, but when he died, in 1385, he left material which was used by a later historian. His work is of great value when speaking of contemporary events.

Foreclosure, one of the remedies of a mortgagee, by which the mortgagor's interest in the property (that is, the equity of redemption) is barred and foreclosed and the mortgagee's estate becomes absolute. [MORTGAGE.]

Foreign Enlistment, the offence of desertion, or seducing to desert, from the army or navy. These offences are now mainly dealt with by the "Naval Discipline Act, 1866," and the "Army Act, 1881," as amended by the successive annual Acts, by which Acts (when the offender is subject to their provisions) he may be tried by a court-martial, who may inflict such punishment as therein prescribed. In addition, however, to the above there are statutes—passed in the reign of George III. —which enact that any person maliciously endeavouring to seduce any person serving in the Royal forces by sea or land from their allegiance, or stirring up such persons to mutiny or to any traitorous or mutinous practice, shall be guilty of felony. Under these Acts he was made punishable with *death*, but by the effect of later statutes he is now liable, if convicted, to penal servitude for life, or any term not less than five years; or to be imprisoned, with or without hard labour or solitary confinement, for any term not more than two years.

Foreign Law is a question of fact, and by a statute passed in the twenty-fourth year of the present reign, the High Court of Justice may remit a case with queries to foreign courts of the countries with which a convention shall have been entered into for the purpose by the British Crown, for ascertainment of the foreign law, and may apply the opinion obtained to the facts of the case. But if no convention has been entered into, this Act is inoperative.

Foreland, NORTH and SOUTH, two promontories on the east coast of Kent, having between them the Goodwin Sands and the sheltered roadstead of the Downs. The North Foreland, said to be identical with Ptolemy's Cantium, is a cliff of nearly 200 feet in height, and has a lighthouse, 85 feet high, showing a light for 20 miles. The South Foreland is 16 miles to the south, and has two fixed lights visible for over 20 miles. In 1666 a four days' sea-fight between Monk and De Ruyter was fought in the neighbourhood.

Forensic Medicine. The frequent combination of medical with legal questions upon inquiries relative to suspected murder, doubtful sanity, and other matters of a like nature, has given rise to a sort of mixed science known as *forensic medicine* or *medical jurisprudence*, which may be considered as common ground to legal and medical practitioners, for it teaches the application of every branch of medical knowledge to the purposes of the law; hence its limits are, on the one hand, the requirements of the law, and, on the other, the whole range of medicine. Forensic medicine is also occasionally required in cases of a civil nature, such as questions of lunacy, or unsoundness of mind, or cases of nuisances injurious to health. It is, however, more frequently in requisition in criminal trials, where the evidence of an expert is frequently required. Thus, in a trial for murder, where the evidence is circumstantial, it is almost always necessary to adduce evidence by a medical practitioner as to the appearance of the body, and the results of a post-mortem

examination. So far as he attempts to account for the symptoms or appearances observed by him, his evidence is merely opinionative. (*See* the works of Taylor, Guy, Beck, and Tidy, on this subject.)

Foreshortening, in drawing or painting, is the representation in correct perspective of an object presented obliquely to the eye, the effect aimed at being to make the object appear as if projecting from the canvas.

Forest Fly, a small brown fly, about a third of an inch in length, which is parasitic on the horse. It creeps about on the belly, and is extremely irritating. Its scientific name is *Hippobosca equina.*

Forest Law. The right of keeping animals in a wild state for mere diversion, though forbidden to the subject, has been at all times admitted as a matter of prerogative to the Sovereign. A forest, though a Royal possession, is capable of being vested in a subject, for if the Sovereign grants a forest to a private person, with words expressly authorising the administration of forest law there, the grantee will have the franchise of a *forest* to its full extent, with all the appropriate courts and officers; and a forest is a right which the owner thereof (whether Sovereign or subject) may have either in his own lands or in the lands of another, and in this respect it differs from a right of common, which issues out of the soil and cannot exist in the same man who is owner of the soil itself (the latter superseding all inferior claims of this kind); but a forest, and indeed all franchises in general, are inheritances collateral to the proprietorship of the land, and may be claimed by a man either in *proprio solo*, or in *alieno solo.* The owner of a forest is also considered (notwithstanding the general rule, that title cannot be made to things *feræ-naturæ*) as having a qualified property in the wild animals of chase and venery there found, so long as they continue there; and no other person can lawfully take them within those precincts, or chase them from thence and take them in other ground. But if a wild animal strays from the forest, it seems to be the property of the owner of the franchise, and will belong to the first taker. [Common.]

Forestry, the science and art of the management of forests. It is sometimes divided into arboriculture (q.v.), which treats of plantations, and sylviculture (q.v.), which deals with natural forests. It studies the conditions best adapted to tree growth and the climatic results of such growth; the protection of forests from injuries; their exploitation or realisation at the period of maturity; their renewal, whether by seeding or planting; their restoration after periods of neglect; the utilisation of their products; and the legitimate increase in the revenue derived from them. The study depends, therefore, largely upon vegetable physiology, but borrows also from systematic and structural botany, meteorology and political economy, and, to some extent, from chemistry, geology, and entomology. The chief direct effects of forests upon climate are (1) screening the soil from the sun's rays; (2) exposing an immense leaf-surface for the cooling process of radiation; and (3) giving off moisture in evaporation. Indirectly, these actions secure greater equability of temperature, humidity, and rainfall, and so regulate the flow of rivers, prevent floods, and maintain springs. In Europe at the present time Russia has 40 per cent. of its area under forest; Norway and Sweden, 34; Austria, 29; Germany, 26; Italy and the Balkan peninsula, 22; Switzerland, 18; France, 17; Spain, Belgium, Holland, and Great Britain, 4; and Denmark, 3. Even in Russia the plentiful supply of timber is only in the north, and in Norway and Sweden the supply shows itself to be by no means inexhaustible. The wasteful destruction of forests in the United States, Canada, India, and many other countries has not only threatened in many cases the future supply of timber, but in some countries has seriously affected the water-supply. Forests supply timber, fuel, material for paper, and a variety of valuable substances such as cork, bark for tanning, gums, dyes, drugs, and articles of food. For both climatic and economic reasons, therefore, it has been urged that forests should be preserved by valuation-surveys and working-plans, by the prohibition of cutting immature trees, by the replacement of mature trees by seedlings, and by the establishment of nurseries for this purpose. The increase in value of maturing timber may be gauged from the consideration that annual rings of wood, if assumed to be of equal width, vary in sectional area in the series 1, 4, 9, 16, 25, etc., giving an annual gain of 3, 5, 7, 9, etc., whilst at the same time the trees are gaining in height and the timber is increasing in quality and, from its size, in value per cubic foot. In Britain trees are generally felled by selection, so that several ages are left upon one area; or coppice (q.v.) with selected "standards" is adopted; or the whole wood when mature is felled and replanted. On the Continent it is the rule to fell by rotation of area, all the trees in each area being of one age; and natural seeding or reproduction is generally relied on to replace the crop. The re-afforestation (*reboisement*) of districts denuded of forests is often, as in the case of Ireland, a matter of national importance. On steep slopes it may have a great effect in checking the removal of the surface-soil by rain, and the landward march of the sand-dunes of the Landes of Bordeaux has been checked by planting the maritime pine. The prevention of forest fires and the checking the ravages of the various fungoid and insect enemies of forest trees are special subjects of the forester's study. On many estates in Scotland the woodlands are under a responsible keeper or forester, but in England their maintenance is in the hands of land-agents. England, not suffering from deficient rainfall and supplied with cheap foreign timber, has neglected the study of forestry more than all other European countries.

Forfar, county town and royal and parliamentary borough of the Montrose group, Forfarshire, in the Vale of Strathmore, at the east end of a small loch. David I., in the 12th century, made it a royal borough, and the market day was formerly Sunday. The site of the old castle is now

occupied by a market cross. Among the chief buildings are a courthouse, townhall, a public hall, county buildings, and several schools, and an infirmary. The principal trade is the manufacture of linen, and there are several factories and bleachworks. Brewing and tanning also are carried on. In 1307 Bruce slaughtered an English garrison here.

Forfarshire, or ANGUS, a county on the east coast of Scotland, having Aberdeen and Kincardine on the N., Perth on the W., the Firth of Tay on the S., and the German Ocean on the E. It is 36 miles long by 30 miles in breadth, and contains 568,750 acres. In the N. and N.W. lies a part of the Grampians, called the Braes of Angus, and rising to a height of 2,600 feet, and in the S. a part of the Sidlaw Hills rises to a height of 1,400 feet. Between these hills lies the Vale of Strathmore, while between the Sidlaw Hills and the Tay is the fertile Carse of Gowrie. The principal rivers are the North and South Esk. The county is highly farmed, and produces good wheat, oats, barley, potatoes, and turnips. Much cattle-rearing is carried on. In most of the towns coarse linen is manufactured, Dundee being the centre of the linen and jute trade. Flagstones are quarried in the Arbroath district, and limestone and slate are worked to a small extent. The county returns one member to Parliament.

Forfeiture. Forfeiture occurred under the feudal system where the tenant committed some act, or omitted some duty in violation of the compact with his lord, such as rendered him unfit to be longer trusted as a vassal. Forfeiture, in modern times, takes place where a tenant grants a larger estate than his own, or where a tenant for life or years assumes to convey the fee simple, or where a lessee commits a breach of any of the covenants in the lease, etc. Also if a copyholder commit waste, or refuses to do suit of court, or a lessee impugns the title of his lessor, the right to take advantage of a forfeiture may be waived by any act of the person entitled which recognises the continuance of the title in the particular tenancy, as, for instance, the receipt of rent by a landlord in respect of a time subsequent to the act of forfeiture. Forfeiture, as between landlord and tenant, has been much restricted, and relief therefrom given by statutes passed during the present reign.

Forficulidæ. [EARWIGS.]

Forge is a furnace employed by smiths in the working of iron and steel. *Forgings* are pieces of wrought-iron or steel that have been worked up to shape, and are ready for further treatment with cutting or other tools.

Forgery. Legal forgery is the false making, counterfeiting, altering, or uttering any instrument, or writing with a fraudulent intent, whereby another may be defrauded. The offence is complete by the making the forged instrument with a fraudulent intent, though it be not published or uttered, and the publishing or uttering of the instrument, knowing it to be forged, is punished in the same manner as the making or counterfeiting. It is not now necessary to constitute forgery that the name of any person should be counterfeited, though this is the most common way in which the crime is committed. Anyone is guilty of forgery who antedates a deed for the purpose of defrauding other parties, though he sign his own name to the instrument, and it is forgery if a man, being instructed to make the will of another, inserts provisions on his own authority. The offence consists in the fraud and deceit. Under the Statute 24 and 25 Vict. c. 98, and numerous other statutes, offences analogous to forgery at common law are made felonies, and are punishable as forgeries; but that punishment is not death as formerly, but penal servitude for life, or for any term not less than five years, or imprisonment with or without hard labour, and with or without solitary confinement, for any term not exceeding two years. The Forged Transfers Act, 1891, enables, but does not oblige, companies and local authorities to make compensation "by a cash payment out of their funds, for any loss arising from a transfer" of their shares, stocks, or securities, "in pursuance of a forged transfer, or of a transfer under a forged power of attorney."

Forget-me-not, a name formerly applied by our unpoetical ancestors to the ground-pine (*Ajuga Chamæpitys*), a labiate plant so rich in turpentine that, if once tasted, it will not soon be forgotten. In quite modern times we have imported the German legend of a knight who was drowned in endeavouring to gather for his lady-love some flowers of the beautiful water scorpion-grass (*Myosotis palustris*)—one of the least hairy plants in the Borage family—transferring to this plant his dying words, "*Vergiss-mein-nicht*" (forget-me-not).

Forlì (Lat. *Forum Livii*), a province and town of Northern Italy, formerly belonging to the States of the Church. The province contains 716 square miles, and has in the W. some low spurs of the Apennines, while in the N. it is flat, and there are malarious swamps along the coast. The chief productions are corn, hemp, flax, madder, saffron, anise, wine, olives, and fruit. Bees and silkworms are reared, and the fisheries are good. Sulphur occurs in great abundance, and is an article of export. The railway from Milan to Ancona passes through the province. The town lies in a fertile plain between the Montone and Ronce rivers, and is 50 miles S.E. of Bologna. It is well built, with broad streets and a central square.

Forlorn Hope, a military term signifying the body of men selected to plant a scaling ladder on a fortress or to be the first to make a breach. It is derived by Professor Skeat from the Dutch *verloren hoop* (pron. *hope*), or "lost band." Similarly the French give the term *enfants perdus* ("lost boys") to the leaders of a storming party.

Formaldehyde (formic or methyl aldehyde, or oxymethylene, CH_2O) is the first of the series of compounds known as *aldehydes* (q.v.). It is an unstable substance only existing as a gas or in dilute solutions, and is formed by the oxidation of methyl alcohol (CH_4O). It readily polymerises (*i.e.* forms more complex molecules of same percentage composition), yielding *paraformaldehyde*

$(CH_2O)_3$, a white solid melting at 171° C. It also changes into a polymer *trioxymethylene* $(CH_2O)_3$, which melts at 60° C. It is noteworthy that from these polymers by a remarkable series of reactions, many of the sugars have been artificially prepared, and in connection with this also, the fact that formaldehyde is found in plant cells which contain chlorophyll seems one of interest.

Formentera, one of the Balearic Isles (q.v.); its length is 13 miles, and breadth from 2 to 10 miles. It has a population of about 2,000.

Formes, KARL (1810–1874), a German bass singer, was born at Mülheim, and first made his mark in the *Zauberflöte* in 1842 at Cologne. He sang at Vienna and in England and America.

Formic Acid, the first of the series of fatty acids; it hence has the formula H·COOH. As in the case of the first compound of many series of organic substances, it differs in many respects from the other members. It is found in stinging nettles, in pine shoots, and in ants (hence the name from *formica*, an ant), and may be prepared artificially by a number of reactions. The usual method is to heat oxalic acid with glycerine; the latter substance, however, does not undergo any final change. The reaction may be expressed by the equation

$$C_2H_2O_4 = H_2CO_2 + CO_2.$$

The action of the glycerine in assisting the reaction is probably due to the formation of intermediate products as indicated thus:—

(i) $C_2H_2O_4 + C_3H_8O_3 = CO_2 + OH_2 + C_3H_7O_2{\cdot}O{\cdot}COH.$

(ii) $C_3H_7O_2{\cdot}O{\cdot}COH + OH_2 = C_3H_8O_3 + H_2CO_2.$

An interesting formation of this acid is the direct synthesis of its salts by the action of carbon monoxide upon potash at 100°.

$$CO + KOH = H{\cdot}CO_2K.$$

It is a mobile liquid of specific gravity 1·2, which boils at 99°, and becomes crystalline at 0° C. It blisters the skin, and has a strong pungent odour. It forms a hydrate with water, with which also it mixes in all proportions. It is decomposed by sulphuric acid into CO (carbon monoxide) and OH_2 (water). It acts as a strong reducing agent, precipitating silver or mercury from solutions of the salts of these metals.

Formicidæ. [ANTS.]

Formosa. 1. An island of the Chinese Sea and province of the Chinese Empire, is separated by a strait of 80 miles and upward in breadth from the mainland province of Fokien. It is 250 miles long by 70 miles broad, and contains 15,000 square miles. The western part of it consists of wide fertile plains, which produce bananas, oranges, rice, corn, pepper, sugar, tea, tobacco, cinnamon, and camphor. The principal exports are camphor, coal, hemp, indigo, sugar, tea, and timber. There are four treaty ports, among them being Taiwan, the capital. A railway runs from Port Ke-lung to the tea-fields. The eastern part of the island is claimed by Japan. Formosa is inhabited by two distinct races, the uncivilised aborigines of the central and eastern uplands, who are of Malay stock, and the civilised Chinese intruders, chiefly from the province of Fokien, on the western plains. Intermediate between these two are the *Pepohoans*, that is, the semi-civilised natives of the western slopes, some of whom, such as the Tsuihoans of the Lake Tsui-sia-hai district and the Sekhoans of the Posia valley, have attained a somewhat high degree of culture, placing them on a level with their Chinese neighbours. But the *Sang-fan* ("wild men") of the interior and the east coast are almost unanimously described by the few travellers that have come in contact with them as exceedingly fierce and treacherous savages at a very low stage of culture. T. L. Bullock, who visited the Boo-hoans and others in 1876, speaks of them as ferocious head-hunters, like the Bornean Dyaks, who attack stealthily in bands, kill for the mere love of bloodshed, and carry off as trophies the heads of their victims. The Song-miau, Hu-lu, and Mow-tau are also mentioned by J. H. Gray as "fierce and inhuman tribes," and the same character is borne by the Kwejjing, Tailokok, Komalan, Peplos, Kali, and other east coast tribes, who are much dreaded by mariners wrecked on that dangerous seaboard. Christianity has made considerable progress amongst the Pepohoans, and the people of the Posia valley are now nearly all converted, though the neighbouring Chinese settlers still remain Buddhists.

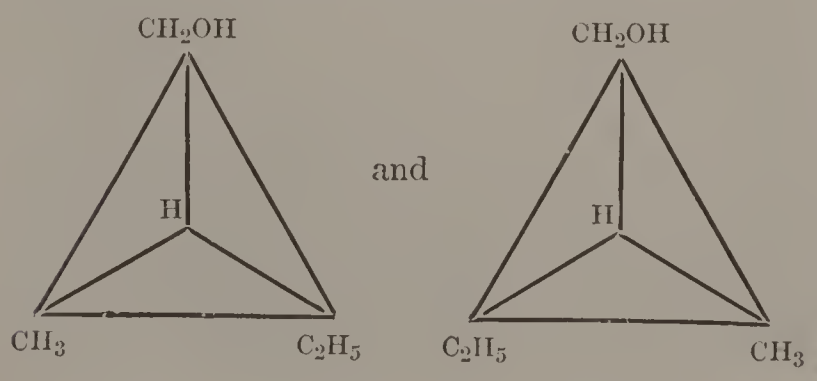
2. An Atlantic island off the west coast of Africa, 30 miles long by 18 miles wide, fertile and well-wooded.

Formose, a compound of composition $C_6H_{12}O_6$, which was prepared by Loew in 1885 by the condensation of *oxymethylene* by means of magnesia. [FORMALDEHYDE.] It appears to be a mixture of different sugars, and its preparation is important as a starting-point in the synthesis of these compounds, which has within recent years been successfully accomplished.

Formula, in general *Physics*, is an equation which will determine the magnitude of some physical quantity, when proper numerical data are known and applied. Similarly, in pure mathematics, a formula means the equation connecting a variable quantity with those upon which its value depends.

Formulæ. In *Chemistry*, the use of symbols to represent chemical substances is one of early date. The alchemists employed the various zodiacal signs and those of the planets to represent the various metals with which they were acquainted. Thus silver was represented by the sign of the crescent moon, ☾; copper by the symbol of the planet Venus, ♀, etc. At the end of the last century it was proposed to represent the metals by circles containing the first letter of their Latin name, thus Ⓕ = iron, while oxygen was to be represented by a horizontal line, and other elements by various geometrical figures. This met with the approval of the great French chemist, Lavoisier, but not of chemists generally, and in 1808 Dalton proposed to represent by various signs, *atoms* of the elements. In his system an atom of hydrogen was represented by ⊙, an atom of oxygen by ○, of nitrogen by ①, etc.;

and by placing together these symbols he proposed to build up chemical formulæ. The simpler notation in use at present, introduced by Berzelius, prevented Dalton's notation from being adopted. In this, the first letter or characteristic letters of the Latin name signifies an atom of the element (or weight proportional to the atomic weight) and the number of atoms (or such quantities) are indicated by a small figure placed to the side of the symbol and generally below. The formula, hence, expresses the proportional composition of a substance and also, where possible, its molecular weight and complexity. Thus *acetylene* is written C_2H_2, not CH, because its vapour density shows that the molecule has the more complex composition. In many cases, however, when the vapour density cannot be determined, the molecular complexity is not known, and here the formula expresses solely the proportions in which the various elements are present in the compound. In such a case the simplest formula is taken which expresses this proportional composition. The attempt to go further in the use of formulæ, and to express the *constitution* of bodies, met with much opposition from many chemists, who regarded it as impossible to determine the mode in which the elements are united. In organic chemistry, however, such *constitutional formulæ* are very largely employed. Thus two substances, ethyl or ordinary alcohol and methyl ether have the same composition formula, C_2H_6O, whilst the vapour densities show this represents the complexity. They differ, however, widely in their properties, the ether being a gas which is only liquefied at very low temperatures, while the alcohol is a liquid boiling at 78° C. All the reactions of the latter indicates that it contains a group of elements, or radical, C_2H_5; while in the case of the former there are present two separate groups, CH_3. The alcohol, therefore, receives the formula $C_2H_5.OH$, while $(CH_3)_2O$ is that ascribed to the methyl ether; formulæ completely justified by all the reactions of the bodies and their relation to other substances. In some cases, however, the use of such constitutional formulæ is insufficient to completely define a substance. Thus two *amyl alcohols* exist, both of which must be represented by the formula $\begin{matrix}CH_3\\C_2H_5\end{matrix}$: $CH.CH_2OH$, but which differ in one respect: one is lævo-rotatory, the other dextro-rotatory. [POLARISATION.] To explain differences of this nature, van't Hoff and Le Bel proposed the use of tridimensional formulæ, in which the difference of the arrangement of the atoms in space accounts for the difference in the behaviour. Thus, in a case above, the compounds would be represented by



in which the tetrahedron is simply employed to indicate the spatial position of the groups, a carbon atom being supposed to occupy the position of the centre of the tetrahedron. The difference between the two formulæ, it is noticed, is exactly similar to that between any object and its image. The application of these formulæ has within recent years been attended with very great success, and the theory has been very largely extended by Wislicenus and others.

Forres, a parliamentary borough of the Inverness group, in the county of Elgin, and 25 miles N.E. of Inverness. It is situated on a sandy height, and is clean, well-paved, and has good buildings. In the old castle Duncan was killed, and close by is the heath upon which Macbeth and Banquo met the witches. A monument, called Sweno's Stone, is said to commemorate a victory over the Danes.

Forrest, EDWIN (1806–1875), an American actor, was born in Philadelphia. In 1820 he first appeared as Douglas in Horne's tragedy. A few years later he played Othello at New York, and in 1836–37 he played in London. In 1845 his Macbeth was hissed, and in return he is said to have hissed Macready and to have greatly offended his English admirers. In 1849 he was the cause of the Astor Place riot in New York, jealousy of Macready again being the determining motive. From 1853 to 1860 he was in retirement, but again came forward at New York, and was successful. His after efforts, however, were in a great measure failures. His last appearance was in 1871.

Forrest, JOHN (b. 1847), was an explorer of Western Australia. He belonged to the Survey Department, and in 1869 set out from Perth in a N.E. direction, and reached long. 123° E., lat. 29° S. through a barren country of salt marsh and bush. In 1870 he surveyed along the S. coast, and in 1874 along the E. He has also surveyed much of Western Australia.

Forster, FRIEDRICH (1791–1868), a German man of letters, was born at Münchengosserstädt. He first studied theology at Jena, and then devoted himself to art and literature. In 1813 he joined the army and became captain, and was for a time professor at the School of Engineering and Artillery at Berlin. He then subscribed to literary journals, and made a tour in Italy, and later received an appointment in the Royal Museum at Berlin. Among the subjects he treated of were *Frederick the Great* and *Frederick William I.*, and he wrote poems and an historic drama. He also published an edition of Hegel and some adaptations of Shakespeare.

Forster, JOHANN GEORG (1754–1794), a German naturalist and man of science, was born at Dantzig. In 1765 he went with his father to inspect some Russian colonies, but the father offended the Russian authorities, and they left Russia and came to England. Both father and son accompanied Captain Cook upon his third voyage. Johann was afterwards professor at Cassel, but appears to have had peculiar views both in politics and other

matters. He afterwards went to Wilna, and then to Russia, finally settling down at Mayence as first librarian to the Elector. When the French Revolution broke out and the French entered Mayence, he was sent by the republicans of Mayence as a deputy to Paris. While he was away the city was retaken by the Prussians, and he lost all his books, papers, and other property. He died in Paris. Among his writings were *An Account of Cook's Voyage*, *Travels in the Netherlands and the Rhine Land*, besides essays on geography, philosophy, etc. He is considered a classic in Germany, and there is a great freshness about his style.

Forster, John (1812–1876), English historian and man of letters, was born at Newcastle, and educated at the grammar school there. He came to London in 1828, and soon began to write for the Liberal papers, and was appointed literary and dramatic critic of the *Examiner*. His *Lives of Eminent British Statesmen* gained him an entry into the best literary circles. In 1843 he was called to the bar. In 1846 he edited the *Daily News* for some months, and from 1847 to 1856 the *Examiner*. Besides contributing many articles to different periodicals, he wrote a *Life of Oliver Goldsmith* (1848), *Biography of Sir John Eliot* (1864), *Biography of Walter Savage Landor* (1868), his well-known *Life of Charles Dickens* (1871–74), and the first volume of a *Life of Swift* (1875). He was for some time a Commissioner in Lunacy.

Forster, William Edward (1819–1886), was born at Bradford, and was educated at the Friends' School, Tottenham, then entered a woollen factory in his native town. In 1845, at the time of the Irish famine, he went over to distribute a relief fund raised by his co-religionists. In 1850 he married Miss Jane Arnold, the eldest daughter of Dr. Arnold of Rugby, and in 1861 he was returned to Parliament for Bradford. In 1865–66 he was Under-Secretary for the Colonies, and in 1868 he was made a Privy Councillor and Vice-President of the Committee on Education. In 1870 he entered the Cabinet, and produced his celebrated Elementary Education Bill, which worked a revolution in English educational ideas. His refusal to abandon entirely the voluntary system began the estrangement between himself and the section of Radicals headed by Mr. Chamberlain, which lasted through the rest of his life. In 1872 he had charge of the Ballot Bill. In 1874, on Mr. Gladstone's retirement from the Liberal leadership, he was offered the post, but refused it. In the same year he visited the United States, and in the following year he was made Lord Rector of Aberdeen University. In 1880 he was appointed Chief Secretary for Ireland, and this appointment gradually led to a divergence of views between himself and his chief. Although he approved greatly of the idea of Imperial Federation, he was opposed to the granting Ireland a Parliament; and his being the instrument for carrying out a policy of coercion made him obnoxious to a large section of Irishmen. On the release of the Irish suspects in 1882 he resigned his post. He had narrowly escaped murder at the hands of the Irish Invincibles. That his fellow-townsmen had confidence in him is shown by the fact of their electing him in his absence in 1885. He was a man of decided views and opinions and great firmness of character, and was respected by both sides of the House, and probably, except in moments of irritation, by his Irish opponents. A statue of him has been placed upon the Thames Embankment in memory of his educational work; and there is a life of him, in two volumes, by Mr. Wemyss Reid.

Fortescue, Sir John (14th century), an English lawyer, was born in Somerset, and educated at Exeter College, Oxford. After going to the bar, he became a governor of Lincoln's Inn, was created Sergeant in 1441, and Lord Chief Justice in 1442, a post which he retained for Henry VI.'s life. He was loyal to the House of Lancaster, and in 1463 he shared the exile of Margaret and Edward, writing his *De Laudibus Legum Angliæ* for the Prince's benefit. In 1471 he received a general pardon from Edward IV. Other works of his are extant.

Forth, a river and estuary of Scotland, formed by the junction of the Duchray and the Dhu, rising in Stirlingshire and Perthshire respectively. The junction is at Aberfoyle—of Nicol Jarvie fame—and after forming the boundary for some distance between Stirlingshire and Perthshire, the river opens out into a broad firth reaching the German Ocean after a course of 170 miles. It flows through a rich country, and through the Links of Forth it winds greatly, the distance between Stirling Bridge and Alloa being 6 miles by land and 12 by water. One of the peculiar features of the river is a curious double tide. The Forth Bridge [Bridge] is one of the greatest engineering triumphs of our day. The river has good salmon, and the estuary has white fish, herrings, and oysters. The Firth narrows at Queen's Ferry—named after Margaret, wife of Malcolm Canmore—and this is supposed, from the Roman remains in the neighbourhood, to have been the Roman "Freti transitus." In mid-channel is Inchgarvie, on which are the ruins of a 16th century castle erected to protect the shipping in St. Margaret's Hope just west of the Ferry, which is the greatest natural harbour for refuge on the east coast of Scotland. In the Civil War a Captain Roy blew up the magazine to keep it out of Cromwell's hands, and in 1779 it was put in repair on account of Paul Jones's raids on the coast. The river is only about a mile across at the ferry, and the Inch reduces the passage on each side to less than 600 yards. There are two lighthouses. The river receives several tributaries.

Fortification. [Mines, Sieges, Ravelins, Military Engineering.]

Fortiguerra, Niccolo (1674–1735), an Italian prelate and poet, born at Pistoja. His chief work was an epic poem called *Ricciardetto*, in thirty cantos, which takes great liberties with history, but displays much keen satire. This may have been the poet's reason for postponing its publication till *after* his death. He also wrote short poems and sonnets.

Fortuna, the Roman goddess of "luck," corresponding with the Greek Tyche. Some represent

her as a daughter of Oceanus, others as a sister of the Fates, and she is represented with various emblems, the most usual being a wheel. Her worship prevailed in Etruria, and she had a temple at Antium with two oracular statues, a temple at Prænestе, and twenty-six temples at Rome. She is sometimes represented with wings, and Horace makes allusion to these.

Fortunatus, the title of an old German *Volksbuch*,. dating from the 15th century, the oldest printed edition being of the date 1509. The story is that Fortunatus and his sons have an inexhaustible purse (*Seckel*) and a wishing-cap (*Wunschhütlein*), which, instead of making them completely happy, ultimately cause their ruin; the moral being that wealth is not all-sufficient. Versions of it in French, Italian, Dutch, Danish, Swedish, and Icelandic have appeared; and it was dramatised by Hans Sachs and Thomas Dekker (*Pleasant Comedy of Old Fortunatus*).

Fortune, Robert (1813–1880), botanist, was born at Berwick. He began life as a gardener, and was employed at the Royal Botanical Gardens at Edinburgh, and then in the gardens at Chiswick. In 1843 the Botanical Society of London sent him to China, and in 1847 was published his *Three Years' Wanderings in Northern China*. He made three more visits to the country in the tea interest, and took plants to India, and collected seeds and plants for the United States of America. He made a fifth journey, and wrote *Yedo and Pekin* in 1863. Other works of his are a *Journey to the Tea-countries of China*, and *Residence among the Chinese*.

Fortuny, Carlo Muriano Y (1839–1874), a Spanish painter, went to Morocco with the Spanish army, and took the opportunity of making studies in Oriental subjects. His *Battle of Tetuan* is at Barcelona; his preference was for Oriental life pictures, and he made many etchings of Oriental subjects. Among his paintings are *The Spanish Marriage*, a *Bibliophile in Richelieu's Library*, and *Academicians choosing a Model*.

Fort Wayne, the capital of Allen county, Indiana, United States of America. It is situate in a picturesque district, at the junction of St. Mary's and St. Joseph's rivers, which unite to form the Maumee. It is the seat of a Roman Catholic bishopric, and has many churches, and several newspapers.

Fort William, a town in the county of Inverness, at the foot of Ben Nevis, and at the S. end of the Caledonian Canal, E. of Loch Linnhe. The fort was built by Monk in 1655, and was rebuilt in 1689, and is still used as a dwelling-house. There is a meteorological observatory in connection with the observatory on Ben Nevis, and a railway unites it to Glasgow.

Forty appears to have been regarded by mankind as a sacred number, particularly by the Jews and the Mahometans. To cite some instances: the Flood lasted 40 days; Moses fasted 40 days on three occasions (Exod. xxiv. 18, xxxiv. 28; Deut. ix. 9–25), as did Joseph after the death of his father; Christ was tempted for a similar period. The Israelites were in the wilderness 40 years. Mahometans mourn 40 days for their dead; and in Eastern romance the number is of frequent occurrence. In the *Arabian Nights* we have the Forty Thieves, and Aladdin is given the same number of days to find the lamp. In *Nasir*, a Persian tale, the hero is to pray 40 days for the restoration of the fairies' fountain; and he shoots an arrow through a finger-ring 40 successive times. For 40 days Shah Mansur was in the power of a sorceress; and in *Ahmed the Cobbler* the treasury is robbed by 40 men. In Wales it was customary to pay 40 loaves and 40 dishes of butter as rent to the Bishop of Llandaff; and a bard's fee was 40 pence if a disciple, and twice that sum if a master. *The Heir of Linne*, in the ballad, tries to borrow 40 pence from John o' the Scales.

Forum. The word signifies an open space, and is connected probably with *foris* = out of doors (cf. θυρα, and door). The Forum Romanum (called later *magnum* or *vetus*) lay between the Palatine, the Capitoline, and the Quirinal hills. It was originally a swamp; and the memory of this fact was preserved by the legend of the Lacus Curtius (Livy, i. 12). When drained it was set apart for the administration of justice. It included the *comitium*, where the *curiæ* or patrician house met, which was separated by the Rostra, or platforms, from the meeting-place of the plebeian assembly or *comitia tributa*. The word Forum was sometimes applied to this latter space alone. In the period between Julius Cæsar and Trajan five additional *fora* were made. The sites of various markets at Rome also bore this name.

Foscari, Francesco, Doge of Venice, born in the latter part of the 14th century, was elected in the 15th century. He waged successful wars against the Turks, and against Visconti, Duke of Milan. In 1443 he was in league with Sforza, Duke of Milan, against Alfonso of Naples and the Pope, and his three sons died in the service. His fourth son, Jacopo, was accused of taking bribes and of treachery, and was tortured and exiled. Having escaped, he was sent back, and the father was deposed through the machinations of a rival, and died broken-hearted. Their history forms the subject of Byron's tragedy, *The Two Foscari*.

Foscolo, Ugo (*circ.* 1776–1827), an Italian prose author and poet, was born at sea, and educated at the university of Padua. His *Thyestes* was produced at Venice just before the fall of the republic, and on the Austrian ascendency he went to Rome, where, in 1802, he published *Ultime Lettere di Jacopo Ortis*. His style is good, but tinged with sadness and melancholy. In 1803 he published a satire. He went to Paris, and, returning to Milan in 1807, he produced a poem *Dei Sepolcri*, and two tragedies, *Ricciardi* and *Ajace*. Ordered to quit Milan, he went to Mantua, where he lived till the abdication of Napoleon, and translated Sterne's *Sentimental Journey*. Owing to his ideas upon Italian independence, he had again to leave the country, and went to Switzerland, Russia, and, in 1815, to England, where he finally died in poor

circumstances at Turnham Green. He wrote *Notes on Dante*, and *An Essay on Petrarch*.

Fossa, the ditch surrounding a Roman camp. Its breadth varied according to circumstances from five to nine or even thirteen feet, its depth from three to thirteen feet.

Fossil, a term, originally including mineral specimens, now restricted to "any body, or the traces of the existence of any body, animal or vegetable, buried in the earth by natural causes." Thus worm-burrows, the cast, external or internal, of a shell, footprints, or the amber from a tree, are as much fossils as the bones, stem, or leaves themselves. No question of age enters into the definition, fossils being the remains either of extinct organisms or of those now living, which are termed "recent." Nor is there now any necessary notion of mineral change implied in the term. The original substance may be wholly or partly preserved, as in the case of the mammoths (q.v.) found frozen entire in Siberia or the little altered chitinous coverings of Palæozoic trilobites and scorpions; or only the external or internal form may be retained with no internal structure; or the original substance may have been molecularly replaced by true *petrifaction*, so that the minutest internal structure is preserved, as in silicified wood. The expression "natural causes" is introduced into the definition to exclude the intentional burial of remains by man and so to delimit the province of archæology from that of geology. The study of fossils is termed *palæontology* (q.v.). Organic remains are seldom preserved as fossils unless speedily protected from air. Birds, insects, and other animals, or plants, that perish on dry land stand little chance, therefore, of preservation; whilst peat-moss vegetation, and aquatic animals, together with those entombed in caves or by mineral springs, are far better represented in the "geological record." Again, it is, as a rule, only hard parts that are preserved, such as the woody stems, leaf-veins and harder fruits of plants, and the calcareous shells, chitinous integuments, bones and teeth of animals. The chief mineral substances that replace the organic matter in fossilisation are calcite, aragonite, silica, mostly as opal, marcasite, chalybite, and less commonly glauconite, vivianite, native copper, fluor, etc. Fossils are important from three points of view: (1) Biologically, as evidencing the former existence of organisms forming series of forms ancestral to those now existing; (2) geographically, as evidencing former differences in the distribution of land and water and climate; and (3) geologically, as affording the chief means for the identification of stratified rocks in distant localities and tracing their chronological succession. [Geology, Homotaxis.]

Foster, John, an English essayist (1770–1843), was born near Halifax, and after a sombre, gloomy childhood was sent to the Baptist College at Bristol. He was not very successful as a minister, and lived successively at Newcastle-on-Tyne, Dublin, Chichester, Bristol, Frome, and died at Stapleton, near Bristol. He published a volume of essays in 1806, the best-known of them being, perhaps, that on *Decision of Character*. Among other works are *An Essay on Popular Ignorance* (1820).

Foster, Stephen Collin (1826–1864), an American song-writer, was born in Pennsylvania, and was in business at Cincinnati. Of his earlier songs, which were of the kind known as negro minstrelsy, *Uncle Ned*, *O Susanna*, and *Old Folks at Home* are examples. At a later period he produced others, which were coloured by the saddened circumstances of his life. Among these later songs are *Old Dog Tray*, *Willie, we have missed You*, and *Come where my Love lies Dreaming*.

Fothergill's Process, a process used for the formation of a photographic dry plate. The method was (1) to coat a glass plate with collodion containing dissolved nitrate of silver, and (2) pour over the coated plate a solution of albumen containing sal-ammoniac (NH_4Cl) dissolved in it, and then allow the plate to dry.

Foucault, Jean Bernard (1819–1868), a French physicist, was born at Paris. He studied medicine, but afterwards gave himself to physical science. He made improvements upon Daguerre's methods in photography, and made researches into the sun's light, polarisation, binocular vision, the passage of light through air and water, and the use of the pendulum in ascertaining the diurnal motion of the earth. [Foucault Pendulum.]

Foucault Currents, in *Electricity*, are eddy-currents set up in the iron cores of armatures, etc., which are useless in increasing the available current for the external circuit, and which may damage the insulation of the parts of the structure by heating up the metal. They may be reduced by making the iron core in thin segments or discs, that shall not offer continuous mass of metal in the direction in which the eddy tends to flow, and yet shall be continuous in the direction of the lines of force that require to be conducted through the core. [Dynamo.]

Foucault Pendulum, an instrument designed to demonstrate the rotation of the earth about its axis. A long fine wire supports a massive metal sphere or pendulum-bob, which is set swinging in any one vertical plane. It tends to stay in that plane, and the rotation of the earth will, by leaving it behind, cause the pendulum to appear to rotate its plane of swinging. The wire should be at least twenty feet long; the first swing should be produced by pulling the bob away from the vertical with a piece of thread, and then burning the thread; and the bob should be heavy enough to carry the motion on for an hour or more. These precautions being taken, the apparent change of plane of oscillation will be rendered evident.

Foucault's Experiment. [Light.]

Fouché, Joseph, Duc d' Otranto (1763–1820), was born at Nantes, and was educated there and at Paris. He taught philosophy at Nantes, and after the Revolution, being then an advocate, he was returned to the Convention as member for the Loire Inférieure. He was on the Committee of Education, and took part in the atrocities of Collot

d'Herbois at Lyons. In 1795 he was expelled from the Convention and imprisoned, but in 1798 was sent as ambassador to Milan, and the next year in the same capacity to Holland. He was recalled and put at the head of the police, and aided Napoleon in the overthrow of the Directory. Dismissed for a time, he resumed office in 1804, and was also made Minister of the Interior. In 1810, Napoleon, who distrusted him, sent him into honourable exile at Rome, but he afterwards returned and lived as a private citizen. In 1813 Napoleon sent for him at Dresden, and the Bourbons would have kept him on in his office had he not resigned after their refusing to follow his advice of granting a general amnesty. When Napoleon was at Elba he declined the royal offer of the headship of police, but accepted a similar offer from Napoleon, who, however, still showed distrust of him. After the fall of Napoleon, Fouché arranged the terms of the capitulation of Paris, and sent the French army beyond the Loire. He became Minister of Police to Louis XVIII., but, finding himself in a position of difficulty, resigned and went abroad, finally dying at Prague.

Fougha (*Beni-Fughal*), a large Kabyle (Berber) tribe of the province of Constantine, Algeria, some sixteen miles south-west of Jijelli. They occupy the densely-wooded slopes enclosing the Wed Missia Valley, and formerly enjoyed special privileges as owners of the surrounding oak and cedar forests, whence the Algerian corsairs derived the materials for their fleets. Such was the value of these forests that, in return for the right of working them, the Government granted to the Foughas concessions of vast arable and pastoral lands in the district extending as far as the neighbourhood of Guelma, which still bears the name of Beni-Fughal. Most of the peasantry in this region belong to the Fougha tribe, which at present numbers altogether nearly 20,000 souls.

Fould, ACHILLE (1800–1867), French financier and politician, was the son of a Jewish banker at Paris. In 1824 he became deputy for the Hautes-Pyrenées. He approved the Revolution of 1848, and was appointed Minister of Finance. He wrote a pamphlet, *Pas d'Assignat*, and, approving of the *coup d'état*, was, at intervals, Finance Minister of the Empire.

Foundation, the substructure upon which all erections are built. Its nature will depend on the soil underneath, being as a rule much simpler in construction when the soil is good firm ground. Rock should be tested in solidity and thickness, and foundations built square thereon. Gravel or hard clay is good if of sufficient thickness and if compressed with rammers. Loose ground must be strengthened artificially. Concrete is much used as a basis, especially over compressible soils, upon which the footings are laid and the structure raised. Piles may also be driven in to support the foundations; they are specially desirable when the structure adjoins the sea, river, or marsh, and are then planted so as to prevent lateral yielding of the subsoil. Submarine foundations may be prepared by simply dropping large boulders in the sea in suitable positions, but the more systematic method of using caissons or coffer-dams (q.v.) is now much employed for the construction of foundations under water.

Foundation Sacrifice, a kind of human sacrifice, in which the victim was buried beneath, or his blood poured over, the foundation-stone of a building to appease the ground spirits and render them protectors of the new building. In some cases, however, the victim was walled up, in the way the Scots herd-boy described to Hugh Miller (*My Schools*, ch. xi.) how the man "was killed on the foundation-stone, just after it was laid, and then built into the wa' by the masons." The custom seems to have been kept up in Europe till the Middle Ages, a beast being generally substituted for a human victim. It still lingers in the East, and was possibly known to the Semites (Joshua vi. 26).

Founding is the art of casting molten metal in moulds. It is not applicable to all metals, requiring that the temperature of melting shall not be inconveniently high, that the molten liquid shall flow readily into the mould and fill up all the corners, and that it shall disengage air-bubbles and solidify into a uniform homogeneous mass. Such properties distinguish the different compounds of iron with carbon, and, while giving the name to *cast*-iron, they render wrought-iron incapable of such treatment and steel either the one or the other, according as the proportion of carbon it contains renders it similar to cast-iron or to wrought-iron. Copper and aluminium cannot be cast, but bronze or gun-metal, which are both alloys of copper and tin, make excellent castings. So also will the bronzes containing phosphorus, aluminium, or ferro-manganese, which are respectively named phosphor-bronze, aluminium-bronze, and manganese-bronze. The other characteristic properties of these alloys render their capability of being cast highly useful in engineering. Cast-iron parts are formed by melting the *pig-iron* (q.v.) in a *cupola*, heated strongly by means of a forced draught, running the metal out of the bottom of the furnace through small gates into a clay-lined wrought-iron ladle, and pouring it into moulds of the requisite shape and size. *Patterns* are made of yellow pine, or in special cases of mahogany or metal; they are made about one-eighth of an inch to the foot larger than the required casting to allow for contraction of the metal on cooling. *Moulds* are then prepared from the patterns in loam or foundry sand; hollows in the castings require special *cores* of loam in the moulds. The molten iron is then poured in, and, after it has solidified, the sand is cleared away and the casting removed. Although castings may be much more complex in form than wrought work, yet if they are badly designed stresses may be produced in them when they cool down from the liquid condition, and they may be so weakened as to fracture with much readiness. On this account sharp angles are to be avoided. all corners being much stronger when well rounded. Thin parts in continuation of thicker parts are liable to solidify first,

and may be fractured later on when the thicker material contracts and solidifies. Much depends then on good design, though many difficulties are overcome by skilful founding. Very rapid cooling of the molten metal is effected by the use of moulds of cast-iron lined with loam. The result of this is that separation of graphite from the iron is prevented; it becomes extremely hard and much more brittle. Such is the nature of *chilled castings*. A reverse effect is produced by keeping the casting for a day or two at high temperature in contact with iron-oxide; the surface then partakes of the nature of wrought-iron, and the casting will stand blows much better than before. Bubbles of gas in the molten liquid must be eliminated before the metal cools. Small holes are made in the mould to allow their exit. Whitworth introduced casting of steel under pressure to prevent the formation of bubbles, and to render the metal denser and stronger. Bronze-founding has been practised for ages. The Colossus of Rhodes was a brass casting, about 100 feet high. A specimen of bronze-work still exists at Constantinople, that was cast some 500 years B.C. It is a pillar formed of three twisted serpents, originally 20 feet high. Modern specimens of bronze-founding show no great advance in excellence of workmanship. The most famous are the "Bavaria" national statue at Munich, 67 feet high; the "Arminius," 90 feet; the "Vierge du Puy," 51 feet; the "Germania," 112 feet; and Bartholdi's "Liberty," 156 feet. The general method of casting is closely similar to that employed in iron-founding. Small bronzes are most beautifully produced by the *cire-perdue* process, known to the ancients. The essential principle is that of using a wax-covered pattern, which can receive all the refinements from the artists' hands. It is embedded in a clay mould; the wax is removed by heating and allowing it to escape, and the molten bronze is then poured into the hollow thus left.

Foundling Hospitals are places where deserted children are received and brought up from funds provided either by charitable individuals or by some public body. The first institution of the kind was established at Milan at the end of the 8th century. Others soon sprung up in Germany, Italy, and France. Of these the Foundling Hospital of Paris is perhaps the most remarkable. Marguerite de Valois had, in 1536, established a home for the *enfants trouvés* who were left in the porch of Notre Dame; a tax for their maintenance had been set apart later; and another home, called the *Couche*, had been founded by the Bishop of Paris. Great evils, however, attended the management of the last, which were in part remedied by the efforts of St. Vincent de Paul (q.v.). Soon after the foundation of the Paris Hospital, the *Couche* was amalgamated with it, and Marguerite de Valois's orphanage was joined to both in 1772. The Revolutionary Government declared all *enfants trouvés* "children of the country," and encouraged the reception of them by the offer of a premium to all women who declared themselves mothers of illegitimate children. Under existing regulations the Paris Hospital receives not only foundlings, but those whose parents are known, as well as destitute orphans, and also incorrigible children (*enfants moralement abandonnés*). After a few days the infants are boarded out with peasants or artisans, the Government granting a subsidy up to their twelfth year, from which time till they come of age they remain under the surveillance of provincial inspectors. Wet-nurses and presents are also sent out by the institution to mothers who need them. Parents may reclaim their children on giving satisfactory proof of their identity; and the adoption of children whose parents are unknown is allowed under satisfactory conditions. Foundlings are now known as *enfants assistés* at Paris. Of these, the annual number provided for by the hospital is about 4,000; that of the incorrigibles about 1,200. Savings-banks have been established for both. The Foundling Hospital of London owes its existence to Captain Thomas Coram, and is supported by voluntary private contributions. It receives only the illegitimate children of mothers who have previously borne a good character. Of these there are about 500; some are boarded out in the country. Of those who live in the hospital, the girls become domestic servants when they are 14, and the boys go into trade or the army at 16. In Russia the Moscow Foundling Hospital accommodates 13,000 children per annum, and that of St. Petersburg 7,500. Special care is taken with the rearing of prematurely born infants. The regulations are very lax. There are similar institutions in New York, Rio de Janeiro, Buenos Ayres, and China. Mortality has been very large in some foundling hospitals. When the Dublin Institution was closed in 1835, the death-rate was 4 in 5; in Russia it has frequently been from 50 to 60 per cent.; and at Vienna has been as high as 75. In France and London it now stands at less than 4 per cent.

Fountain, a spring of water. The term is commonly confined to springs, which, whether natural or artificial in themselves, have been in some manner ornamented through human art. The adornment of such objects of common use arose naturally with the growth of city life, and was further promoted by the reverence felt for springs, each of which was believed to be the haunt of some protecting deity. The ancient Greek and Roman fountains, described by Pausanias and Vitruvius respectively, were formed either by covering a spring over, to keep the water fresh and cool, or by placing a cistern at some distance from the ground and allowing a jet to play from it into an artificial basin. Those of the former kind, common in Greece, were decorated with a statue of the deity to whom the spring was sacred, or sculpture representing some mythological subject, either within or outside the stonework of the fountain. At Rome the water often flowed from the bronze statue of a Triton, Nereid, or other fabulous creature. Many fountains of this kind have been discovered at Pompeii. The public fountains furnished the ordinary water supply both among the Greeks and Romans, though the more wealthy inhabitants of

Rome had pipes leading to their own houses. In either case the water was conveyed to the city through the great aqueducts. Mediæval fountains originated in the same manner as those of the ancient world. Springs had held an important place in the element-worship of Celts and Teutons; when Christianity drove out Paganism they became fountains dedicated to the Madonna or one of the saints. These varied considerably in form. A common pattern was that of a square, round, and polygonal basin, in the centre of which was a column, whence spouts issued at intervals, so that several persons could fill their vessels at the same time. Some of these fountains are perfectly plain, while others are decorated with niches for figures of saints and other Gothic ornaments. As sanitary science progresses, and greater attention is paid to the purity of the water-supply, fountains cease to serve any but an ornamental purpose. Among the most famous ornamental fountains are those at Versailles and at the Crystal Palace, Sydenham. Fine effects are now produced by allowing the jets of a fountain to play on sheets of plate-glass, covering a chamber illuminated by the electric-light; pieces of glass of various tints are then introduced between the jets and the light beneath them, and these are changed at the same time that the height and combination of the jets is altered, so as to cause an infinite variety of movement and colour.

Fountains Abbey, in the West Riding of Yorkshire, three miles S.W. of Ripon, is one of the best specimens of a ruined abbey to be found in England. It is said to have been founded in 1114—a year after the foundation of Rievaulx—by Cistercian monks, who were expelled from St. Mary's, York, and built some wooden cells under a huge elm. The abbey eventually became wealthy, and the buildings were added to at different periods, and so exhibit a great variety of architecture. There are fragments of the gate-house, the hospitium, the nave, transept, choir, and tower of 168 feet, and a beautiful Lady Chapel, with slender, octagonal pillars of considerable height, bearing lofty arches, which are connected with the clerestory of the nave. There are also remains of refectory, chapter-house, and abbot's house. By the spring, which is supposed to have originated the name of the abbey, Robin Hood fought with the curtal friar.

Fouqué, Heinrich, Baron de la Motte (1777–1843), a German author, was born at Brandenburg, and served as a lieutenant in the Prussian Guards, rising, after some years of intervening retirement, to major. He afterwards went to Paris, and then lived on his estate, and died at Berlin. Though he wrote some poetry, he is chiefly known by his prose, his best-known works being *Aslauga's Knight*, *Sintram and his Companions*, and *Undine*. This last has been widely translated, and has been dramatised, and is a wonderfully pretty example of imaginative mysticism. The weirdly allegorical story of Sintram has also many admirers.

Fouquet, Nicolas (1615–1680), a French financier, born of a good Breton family. In 1650 he was made *procureur-général*, and in 1653 *surintendant des finances* as a reward for his loyalty in the struggle with the Fronde. He was afterwards, however, accused of wasting and devoting to his own purposes the public funds, one special accusation being that he employed 18 millions in building a château for himself. The king, spurred on by Colbert and jealous of certain alleged pretensions upon Fouquet's part towards Louise de la Vallière, allowed him to be arrested and tried before a commission, the result of the trial—which lasted four years—being a lifelong imprisonment. La Fontaine, Madame de Sévigné, and others vainly pleaded for Fouquet.

Fouquier - Tinville, Antoine Quentin (1747–1795), one of the most repulsive figures of the Reign of Terror, was born at Héronelles. He entered with zeal into the Revolution, and much pleased Robespierre, who obtained for him the post of Public Accuser. He seemed mad for blood, and besides compassing the death of thousands of royalists, and preparing the disgraceful articles of accusation against Marie Antoinette, he was prepared to guillotine Robespierre and all his colleagues. He was finally guillotined himself, and displayed great want of courage at his execution.

Fourier, François Marie Charles (1772–1837), a noted French Socialistic theoriser, was born at Besançon. His father left him a small fortune, and he embarked in business first at Rouen and then at Lyons. During the Revolution he was a conscript. Afterwards in business employ at Marseilles, he took a disgust for trade, and determined to give all his attention to forming Socialistic plans. His idea of Phalansteries, in which each man's natural inclination (aided by emulation and sexual sentiment), was to determine his work, and each should work for the common good, without, however, the dead level of equal interest and equal property, is set forth in his treatise upon *L'Association Domestique Agricole*. Eventually he became insane. Though many of his schemes were wildly absurd, he was among the first to observe the great benefits of co-operation and the concentration of industry. Unsuccessful attempts were made in France and America to carry out his views.

Fourier, Jean Baptiste (1768–1830), a French mathematician, was born at Auxerre, and educated at the military school there, becoming a teacher in it at eighteen. He then taught at Paris, and followed Napoleon to Egypt, where he did some political work, and wrote an introduction to the *Description de l'Égypte*. In 1802 he drained some marshes in the department of Isère where he was prefect. In 1815 he became a member of the Academy of Sciences, and later was made life-secretary of it. Among his works were an *Analytical Theory of Heat*, a *Theory of Equations*, and *Analysis of Determinate Equations*, and a treatise upon *Terrestrial Heat* and that of planets.

Fourier Series offer a method of analysing any irregular curve and determining simple harmonic constituents that shall, within any assigned limits, combine to produce the curve. This is the

geometrical representation of the problem, which has, however, a far-reaching application in the higher branches of physical science. To take one example. the irregular distribution of heat conducted from the surface of the earth to the interior may, by means of the Fourier series principle, be analysed into a number of simple harmonic distributions. [HARMONIC.]

Fowl. [POULTRY].

Fowler, SIR JOHN, born 1817 at Sheffield, is a noted civil engineer. He took part in the construction of the London, Brighton, and South Coast Railway, the Underground Railway, and in river and dock works, and was knighted in 1885 for services in Egypt. He has since, in connection with Sir Benjamin Baker, constructed the Forth Bridge.

Fowler's Solution (*Liquor arsenicalis*), an important pharmacopœial preparation made by boiling arsenious acid and carbonate of potassium in water, and then adding compound tincture of lavender. It is highly poisonous, but is very useful in small doses in certain skin diseases and in some forms of dyspepsia.

Fox, any species of the Alopecoid, or Vulpine, section of the family Canidæ, sometimes made a separate genus (*Vulpes*), but generally included in the genus *Canis*, from the typical members of which the Alopecoids differ chiefly in some minor characters of the skull and dentition, and in their more elongated body. The pupil is generally oblique, the muzzle pointed, and the tail bushy ; but this last character is also possessed by the South American dogs, which have wolf-like skulls. Foxes are widely distributed, chiefly in the northern hemisphere, but none are found in South America. The common fox of Europe (*Canis vulpes* = *Vulpes alopex*) either as we know it, or under more or less well-marked varieties, some of which have been elevated to specific rank (*Proc. Zool. Soc.*, 1887, p. 635), has nearly the range of the family. The average length is nearly four feet, of which the tail takes up more than a quarter. The legs are slender, and the long lank body is thickly covered with reddish-brown hair, which makes the animal look larger than it really is. There is some white on the under surface, the ears and toes are black, and black hairs occur plentifully in the tail, the tip of which is mostly white. Foxes are solitary, nocturnal animals, generally living in burrows or "earths," with several exits. They rarely excavate a burrow for themselves, but drive out rabbits or badgers from their holes, though they are said sometimes to share a retreat with these last-named animals. Occasionally they make a dwelling under rocks or stones. They often lie in cover in woods ; and a vixen (for so the bitch-fox is called) has been known to whelp under a rick-staddle in a farmyard. Little of an animal nature comes amiss to foxes in the way of food. Their principal diet consists of hares, rabbits, partridges, poultry, and occasionally young lambs, though they do not disdain rats, mice, and frogs. They eat putrid meat readily, and in some cases are said to resort to the seashore to feed on molluscs and crustaceans. Foxes pair early in the year ; the period of gestation is about nine weeks. The cubs attain full size in eighteen months, and the duration of life is said to be thirteen or fourteen years. Foxes are not easily domesticated ; but when taken young they have been tamed (*see Field*, October 8th, 1892), but their strong smell renders them anything but agreeable pets. The cunning of the fox is proverbial, and it was one of the first animals in which the habit of feigning death as a means of escape from danger was noticed. The skin is valuable for its fur, and on this account foxes are shot and trapped without mercy everywhere except in England, where to kill a fox except in orthodox fashion with horn and hound is little short of a crime. [FOX-HUNTING.] The difference between the British and the American fox (*C. fulvus*) is very slight ; but the latter has the tail covered with soft fur uniformly mixed with long hair. In the grey fox (*C. virginianus*) and the shore fox (*C. littoralis*), also American forms, there is a ridge of stiff hairs on the upper line of the tail, and by some writers they are on this account made a separate genus (*Urocyon*). The Asiatic species are about three feet long, and the African forms still smaller. [FENNEC.] The habitat of the Arctic fox (*C. lagopus*) is indicated by its distinguishing epithet. It is about three feet long, of which the tail counts for a foot, with a very bushy tail, and the soles of the feet are thickly furred. It was long the custom to cite this animal as a good instance of protective coloration, the fur being said to be greyish-blue in summer, changing to white in winter ; but Dr. Robert Brown asserts that the blue and the white foxes are distinct varieties, and the colour is totally independent of the season. These animals are cleanly in habit, and playful in disposition. They feed on mice and lemmings, and when food is plentiful hide it in the snow for a future day. The blue skins are more valuable than the white.

Fox, CHARLES JAMES (1749–1806), one of the most eminent statesmen and politicians of the end of the 18th and beginning of the 19th centuries. His father, Lord Holland, while indulging him in all his whims, took care of his education, and sent him to Eton, where the boy became a good classic, and wrote good Latin and Greek. From Eton the youth went to Oxford, and before he was of age he sat in Parliament for Midhurst, and in 1770 was a lord of the Admiralty, and a commissioner of the Treasury in 1772. In the early part of his career he voted chiefly according to his father's wishes, but later he became independent, and a disagreement with Lord North sent him into opposition. When the American War of Independence broke out, he joined with Burke in opposing and speaking against it. In 1780 he was elected to represent the city of Westminster, and he became Secretary of State in Lord Rockingham's Government. When Lord Rockingham died Pitt left the Government, and Fox formed, with Lord North, the coalition which led to his temporary unpopularity. When Pitt was in power, Fox headed a strong opposition, and fought hard over the Regency Bill, but Pitt won the day.

In 1790 Fox regained the popularity he had lost, by opposing the idea of war with Spain and Russia, and by supporting the rights of juries in his Libel Bill. The breaking out of the French Revolution brought about an estrangement with Burke, who publicly renounced Fox's friendship. Fox opposed the war party, and supported Mr. Addington in concluding the Peace of Amiens in 1801, but acquiesced in the war on becoming Lord Grenville's Foreign Secretary. His death followed closely upon that of Pitt. Though hardly the equal of Pitt, Burke, and others in eloquence, Fox was an able speaker and debater, and had a manly, telling style of delivery. The charm of his personal character made him a general favourite.

Fox, GEORGE (1624–1690), the founder of the sect of Friends, was born at Drayton in Leicestershire. In his youth he tended sheep, and the solitary nature of his life gave him a great tendency towards meditation. It was at the age of nineteen that he felt a Divine call to give up all for religion, and in 1648 he began to preach in Manchester and the neighbourhood; but it was in Derby that the derisive name of Quakers was bestowed on his followers, though the Society was not formed till 1666. Fox met with much persecution at the hands of local authorities. In 1665 he was confined in Scarborough Castle, and he tells us how, in one of the rooms facing the sea, "the wind drove in the rain forcibly, so that water came over his head and ran about the room, so that he was fain to skim it up with a platter." His travels and labours and imprisonments broke his health in his latter years. He travelled in Wales, Scotland, Barbadoes, Jamaica, Holland, and Germany, and recorded his experiences in his *Journal*. He wrote (besides the *Journal*) *Epistles*, and *Doctrinal Pieces*.

Fox, RICHARD, an English fifteenth-century prelate, who filled at one time or another four bishoprics. He was born near Grantham, and educated at Magdalen College, Oxford, at Cambridge, and at Paris. In Paris he was introduced to the future Henry VII. of England, and upon the king's accession he was made a privy councillor and much employed, and became finally Bishop of Winchester. The king appointed him an executor of his will, and recommended him to Henry VIII. The new king, however, did not much like him, and he was soon outstripped in influence by Wolsey, whom he had introduced to the king. His later life was passed in retirement, and during this period he founded Corpus Christi College, Oxford.

Foxe, JOHN (1517–1587), Church historian, was born at Boston in Lincolnshire. He was entered at Brasenose College, Oxford, and in 1543 became Fellow of Magdalen, which society expelled him for heresy in 1545. In Queen Mary's reign he went to Basel, and corrected the press for a printer there. In Elizabeth's reign he returned to England, and received a pension from the Duke of Norfolk. He was also a prebendary of Salisbury. In 1575 he pleaded with the queen on behalf of persecuted Dutch Anabaptists. His *History of the Acts and Monuments of the Church*, commonly called the *Book of Martyrs*, was first printed in 1563, and has passed through many editions.

Foxglove (*Digitalis purpurea*), the only British species of a genus of Scrophulariaceæ. It is biennial; has an erect stem 3 to 4 feet high, covered with grey down; scattered downy leaves; and a terminal bracteate raceme of pendulous monosymmetrical campanulate flowers. The corolla is rose-colour, or, rarely, cream-colour, with dark spots and light-coloured hairs inside; the didynamous stamens are within the tube; and the fruit is a many-seeded capsule. The whole plant contains a poisonous substance known as *digitalin*, which reduces the heart's action. The dried leaves are employed in medicine as a sedative and diuretic in dropsy and heart-disease; but large doses cause vomiting, purging, and fainting, and may prove fatal. It was introduced into medicine by the botanist Withering in 1785. The plant is commonly cultivated for the beauty of its flowers. It is the badge of the Farquharson clan.

Foxhound, a breed of dogs used in England for hunting foxes, and generally supposed to be descended from the Old English Hound, with a large admixture of greyhound blood to give the necessary speed—the powers of scent, tongue, and endurance being derived from the original stock. Breeding on definite principles seems to have been carried on early in the 17th century, though it was not till much later that the breed became fixed. The height of a foxhound at the shoulder is from 22 in. to 24 in.; the head should be large, with a deep muzzle and long rounded ears, the back short and well developed, the legs muscular, the feet round with well-arched toes, and the tail nearly straight. The fur is short, and the colour is white, with a greater or less amount of black, or black-and-tan markings.

Fox-hunting, as a sport, has been carried on for about 200 years. Before that time foxes were treated as vermin. [Fox.] They were driven into nets or run to earth and dug out. A certain Mr. Roper seems to have been the first "huntsman." He managed a pack of foxhounds for the Duke of Monmouth and Lord Grey, and afterwards, with the Duke of Bolton, owned another. His death, in 1715, actually took place in the hunting-field. Among the earlier established hunts were the Charlton, the Brocklesby, and the Sinnington. The Belvoir pack dates from 1740, and the Pytchley from 1750; and Sir Philip Jennings hunted foxes in the New Forest about the same time. In early days the hunting "countries" were much larger than at present, one of them (the Berkeley) extending from Bristol to London. Hounds used to meet soon after daylight and track the fox by means of the line he had taken on returning from his search for food. The time of meeting is now usually about 11.0 a.m. The fox is drawn from cover, has a little time to get away before the halloo is given by the whipper-in, and is then run. Much depends on the "scent," which is very uncertain. A hunt consists of a master, or committee; a huntsman, who, if he is a professional, has the management

of the kennels; one or two whippers-in, a stud-groom to superintend the stables, and various feeders and helpers. Gamekeepers are given a reward for stopping "earths." The Duke of Beaufort, Sir Watkin Wynn, and other masters undertake the whole expense connected with their pack; but a subscription of the hunt is more general. A special fund is set apart for compensation to those whose poultry have been injured by foxes. In 1889 there were 154 packs of foxhounds in England, 17 in Ireland, and 9 in Wales. The cost of each day's hunting has been estimated at £600. Cub-hunting begins soon after harvest, and regular fox-hunting lasts from about November 1st to April 1st. The sport has been introduced in India, where the Peshawur Vale hounds and those of the Maharajah of Mysore are the chief packs; in Canada (Montreal) and Manitoba, and also at the Cape, in Bechuanaland, New Zealand, and Cyprus. In Florida the fox is hunted by moonlight. There is a volume on Hunting in the Badminton Library, written by the Duke of Beaufort and Mr. Mowbray Morris.

Fox Indians (Outtagaumie), a western branch of the Algonquian family, who have long been associated with the kindred Sacs (Sauks). After the expulsion of the latter from the Upper St. Lawrence river by the Iroquois, they escaped westwards along the southern shores of the great lakes; but, being still pursued by their implacable enemies, they withdrew to the Green Bay district, Lake Michigan. Here they were joined by the Foxes from the Upper Mississippi, and soon after the two confederate tribes established themselves in the Rock River Valley. Later they were removed by the American Government, some to Iowa, some to Indian Territory. The latter, reduced, according to Flemming, to less than a hundred in 1889, have hitherto rejected all civilising influences, while those of Iowa, numbering about 500 in Tama and Toledo counties, have abandoned most of their tribal usages and become peaceful agriculturists. In 1891 the reserve of the Sacs and Foxes, E. of Oklahoma in Indian Territory, was thrown open to colonisation, so that this division of the two allied tribes may now be regarded as extinct or absorbed in the general population.

Fox Shark (*Alopecias vulpes*), the single species of the genus, occurring sometimes on the British coast, and common in the Atlantic, some parts of the Pacific, and in the Mediterranean. The maximum length is 15 feet, of which half is taken up by the caudal fin, which has the upper lobe enormously prolonged. The teeth are of moderate size, anal and second dorsal small, pectorals and first dorsals large. These fish prey upon herrings, pilchards, and sprats, and from their beating the water with their tail to frighten their prey, they are often called Threshers. There is no foundation for the story that they attack whales.

Fox Terrier, a breed of white hound-marked terriers, used to drive foxes from their earths, or to give notice by barking as to where Reynard is so that the diggers-out may dislodge him. They are also capital vermin-killers, and from their intelligence and good temper are highly valued as companions. The height at the shoulder should be about 14 in., and the weight from 17 lbs. to 20 lbs. The head should be flat and narrow, with clean-cut jaw, black nose, small eyes full of fire, and V-shaped ears carried close to the cheek, the neck clean and muscular, shoulders long and sloping back, chest deep, and narrow rather than broad; back, loins, and hind quarters very strong, and forelegs straight when viewed in any direction. The coat, whether smooth or wire-haired, should be close and abundant.

Foy, Maximilien Sébastien (1775–1825), a French general and politician, was born at Ham. Joining the army in 1791, he fought in the Army of the North, and later distinguished himself in the Rhine and Moselle campaigns. In 1801 he commanded the vanguard of the army of Italy, in 1805 commanded artillery in Austria, and in 1807 went to Turkey to oppose the British and Russians. He then fought with distinction in the Peninsula, and as commander of a division received his fifteenth wound at Waterloo. In 1819 he was returned as deputy for the Aisne department, and distinguished himself as a speaker. He was a Liberal in politics, and a great advocate of civil liberty. Some of his speeches have been published, and his wife wrote a history of the Peninsular War from his papers.

Foyers, Falls of, are two cataracts in Inverness-shire on the river Foyers, $2\frac{1}{2}$ miles from the spot where it falls into Loch Ness. The upper fall is about 30 feet high, and the lower about 90, and the glen, through which the falls pass, has wild and romantic scenery. Old Edie Ochiltree speaks of the tide round Halket Head running like the Falls of Foyers.

Fracastoro, Girolamo (1483–1553), a poet of the Renaissance, was born at Verona. His chief work was a poem in Latin, *Syphilis*, dedicated to Cardinal Bembo, and he wrote a later one on the patriarch Joseph. He has been sometimes ranked next to Virgil. Another poem is *Alcon; sive de Cura Canum Venaticorum.* He also wrote in prose upon sympathy and antipathy, and upon contagion and contagious diseases.

Fraction, in the theory of numbers, means some portion of any unit or of any multiple of that unit. Regarding in arithmetic 1 as our fundamental unit, any portion thereof is called a fraction; so also is any portion of any multiple of 1, if expressed as such. Any portion less than unity is called a *proper* fraction; any portion greater than unity, an *improper* fraction. There are two methods of denoting fractions in arithmetic—the one on the Vulgar Fraction system, the other on the Decimal Fraction system. The former writes the multiple of the unit just above the number of equal parts into which that multiple is divided to represent the given fraction. The upper number is called the *numerator*, and the lower the *denominator*. Thus, $\frac{1}{12}$ means one of the twelve equal parts into which unity itself may be divided; $\frac{113}{355}$ means one of the 355 equal parts into which the quantity represented by 113 units may be divided; and similarly for the

fraction $\frac{3}{1}\frac{5}{1}\frac{5}{3}$. In this last case 355 is the numerator, and 113 the denominator. The improper fraction $\frac{2}{1}\frac{2}{1}\frac{6}{3}$ will be found identical with 2 units, and it may thus be seen that any number, whether whole or otherwise, may be regarded as fractional; and the former may therefore, in the event of their presence among ordinary fractions, be submitted to the same arithmetical processes as the latter. It should further be noticed that $\frac{1}{3}\frac{1}{5}\frac{3}{5}$ represents 113 of the 355 equal parts into which unity may be divided. This is a different notion to that involved in the definition, and requires to be deduced therefrom before its truth can be assumed. Decimal fractions are such that the number of parts, into which unity or its multiples are divided, are always powers of 10, such as 10, 100, or 1000. Thus, $\frac{3}{1000}\frac{7}{}\frac{9}{}$ is a decimal fraction, though it is usually written in the form ·379, the fact that the denominator is 1000 being signified by the *decimal-point* being placed directly in front of the 379. [For the rule concerning the position of the point, *see* DECIMAL FRACTIONS.] In algebra exactly the same ideas hold, but decimal notation is impossible unless the quantities are known numerically. Hence the Vulgar Fraction notation is used, and the expression $\frac{a}{b}$ may be readily interpreted. The applications of fractional forms may be much extended by introducing fractional values of numerator and denominator. No meaning at first attaches to the expression $\frac{2\frac{1}{3}}{7\frac{1}{2}}$, for we cannot conceive of the number $2\frac{1}{3}$ being divided into $7\frac{1}{2}$ equal parts. Nevertheless, in simpler fractions it is seen that multiplication of numerator and denominator together by the same number does not alter the fraction; and, assuming this law to hold true generally, the above fraction should not alter if the two terms in it are multiplied by 6. This gives its value $\frac{1}{4}\frac{4}{5}$, the meaning of which is more obvious.

Fractional Distillation. [DISTILLATION.]

Fractures (Latin *frango*, *fractum*, to break), the breaking of a bone into two or more fragments. A fracture may be *simple*, when there is no track of communication between the broken bone and the surface; *compound*, when such a communication exists; *complicated*, when the injury producing the fracture causes some associated mischief, such as a dislocation, to result. Other terms are employed to describe certain fractures. A *comminuted* fracture, of course, implies that the bone is broken up into several fragments; a *greenstiek* fracture signifies that the bone is broken in the same way as when a green stick is snapped across the knee. (This form only occurs in the soft and yielding bones of children.) Fractures may be produced by *direct* or by *indirect* violence. In the former case, as a result of a blow, the bone gives way at the point struck; in the latter the bone is subjected to the influence of two or more opposing forces, and gives way at its weakest point. A fracture may be produced by sudden muscular contraction, apart from any external injury; for example, the patella is sometimes broken when a man attempts to save himself from falling, the extensor muscles of the thigh being suddenly put into action. There are certain conditions which predispose to fracture. Rickets and scurvy render the bones unduly fragile; again, the pliable bones of children are much less readily broken than are the brittle bones of advancing life. Fractures are much more common in men than in women.

Symptoms. These are pain, swelling, deformity, inability to move the injured parts, and in some cases the existence of unnatural mobility at the site of injury, and finally *crepitus*. This last is the most important of all the symptoms of fracture, but it is not invariably present. The peculiar grating sensation, which is elicited when the two broken ends of the bone rub one against the other, is quite unmistakable by the surgeon. The bones in which fracture most commonly occurs are the clavicle, the radius at its lower end (Colles' fracture), the femur, the fibula (Pott's fracture), and the ribs. The repair of a fracture is brought about by the effusion of lymph, which occurs at the site of injury, and which envelopes the broken ends of the bone, and gradually becomes infiltrated with calcareous salts and then ossified. The effused inflammatory material is called *callus*. When the two ends of the bone are not steadied, an excessive amount of this callus (*prorisional callus*) is at first thrown out, and some of it is subsequently absorbed, what remains being termed *permanent callus*. Where, however, the broken ends of the bone are maintained in close apposition throughout, no excessive callus formation occurs.

Treatment. When a bone has been broken, it is of the first importance to ensure that the injured parts are disturbed as little as possible until skilled assistance can be procured. If one of the bones of the limbs be broken, the limb above and below the injured spot should be rendered immovable by the application of a splint, before any attempt is made to disturb the patient. A temporary splint can be improvised by applying a walking-stick or other rigid body to the limb, and fixing it above and below with handkerchiefs. In the case of the leg, if such appliances are not to hand, the injured limb can be attached to the sound one. The surgeon's first proceeding in dealing with a fracture is to *reduce* or *set* it—that is to say, the injured fragments are placed by manipulation as nearly as possible in their natural position. For the satisfactory reduction of a fracture it is often considered advisable to administer an anæsthetic. When the fracture has been set, a *splint* is applied to the limb so as to maintain the parts immovable, and to keep them so while the process of healing goes on; a splint may be made of wood or guttapercha; in some cases a plaster-of-Paris bandage is applied and allowed to set in an appropriate position. In some rare instances imperfect union of the broken ends occurs, and an ununited fracture results. There are certain serious complications of fractures —*e.g. œdema*, *gangrene*, and the septic troubles which are sometimes associated with a compound fracture.

Fra Diavolo (1769 (?)–1806), an Italian brigand, whose real name was MICHELE PEZZA. Born at

Itri, near Gaëta, he was successively stocking-weaver, soldier, and monk. When disfrocked for misconduct he retired to the mountains of Calabria, where he gained the name of "Friar Devil" for his cold-blooded robberies and murders. In 1798 he rescued Gaëta from the French, and in the following year assisted Cardinal Ruffo against them. For his services he not only received his pardon, but was also pensioned and given the rank of colonel in the Neapolitan army. Driven out of Gaëta and Calabria by the troops of Joseph Bonaparte in 1806, he concerted a rising with the English and

MAP OF FRANCE.

the ex-queen. After visiting Capri and other islands he again landed in Calabria, but was betrayed to the French and executed at Naples.

Fragonard, JEAN HONORÉ (1732–1806), a French painter, was born at Grasse in Provence. After gaining the *grand prix de peinture* in 1752, he went to study at Rome. In 1765 his *Coresus and Callirrhoe* gained him election to the Paris Academy, and until the Revolution, when he was appointed a keeper of the Musée, he continued to paint excellent landscapes after Ruysdael and historical and *genre* pictures. The latter, many of which are in the La Caze collection in the Louvre, were highly popular on account of their voluptuous grace and fine colouring. In spite of his early success, the artist died poor. His son, ALEXANDRE EVARISTE (1780–1850), excelled in sculpture and historical painting.

Framlingham, a market town in Suffolk, 22 miles N.N.E. of Ipswich, with a population of 2,518. The castle was successively the seat of the Bigods, Mowbrays, and Howards, Earls and Dukes of Norfolk, but now belongs to Pembroke College, Cambridge. From hence, on the death of Edward VI., Mary Tudor set out for London to gain possession of the crown. The flintwork church, recently restored, contains the tomb of Surrey, the poet. The Albert Memorial Middle Class College was built in 1865.

Franc, a silver coin, weighing 5 grammes, and equivalent to about 9½d. The name was first adopted in France in 1799 as a substitute for the old *livre*, and was adopted as the unit of the monetary system in Belgium, Italy, and Switzerland in 1865. It is divided into 100 centimes or 20 sous (5 centimes). In Greece, where it was adopted in 1882, it is called *drachma;* in Spain (in 1871), *peseta;* and the same coin has other names in Roumania, Servia, and Bulgaria. In Italy a *lira* is a franc.

France, a country on the western side of Europe, is situated between the 43rd and 51st degrees of north latitude, and from 8° 25′ east longitude to 4° 45′ west. The total area is reckoned as nearly 204,100 square miles. The boundaries are the English Channel on the N., the Atlantic on the W., the Pyrenean mountains and the Mediterranean Sea to the S., and on the E. the Alps, the Jura, and the Vosges mountains, leaving as the only unprotected frontier the north-eastern corner, bordering on Germany and Belgium, and this has accordingly been the battlefield of European nations.

The oldest rock which comes to the surface is the granite, which forms Cape Finisterre and great

part of the peninsula of Brittany. From thence follow in regular gradation east and south, limestone, chalk down to the tertiaries, and wide spaces of post-tertiary and alluvial soil. On the south-east these meet the slopes and the various strata depending on the Alps. The Jura and the Vosges are thought to have been part of a separate island, and consist of parallel ranges, none of any great height, and consisting of the strata called after the Jura, limestone, chalk, etc. The Pyrenees are igneous towards their eastern extremity, afterwards of the limestone formation; and, though their height is not of the highest order, they afford few passes. Separated from them by a depression, called the Gap of Narbonne, is the wonderful wild volcanic group of Auvergne, extinct but showing astonishing traces of its origin. The hills, culminating in the Côte d'Or, run on to join the Vosges to the north-east, and to the north-west are called the Morvan.

These elevations divide France into numerous river-basins. The northern one from the Vosges contains the streams of the Seine, Upper Saône, Somme, and Marne. Starting from the Jura, the Loire, with its tributaries, runs westward to the Bay of Biscay. The Garonne flows north-west from the Pyrenees, and the Lower Saône and Rhone come down nearly due north and south through the valleys between the Alps and the Jura.

It will be easier to speak of the productions and condition of France in connection with the history than by separating the subjects. When first known to history this country was inhabited by Celts, and called Gallia, and was the centre whence swarms of plunderers poured over the mountains into Italy; but the Phœnicians and Greeks had a few trading cities on the Mediterranean coast—especially Marseilles—where in the seaport towns traces of descent from the Greeks are said still to be found. The Gauls were divided into tribes, whose names are still to be found in those of the towns. In 125 B.C. the Romans formed in the east of the Rhone a settlement ever since called Provincia or "the Province," whose capital was Aquæ Sextiæ (now Aix), and where corrupted Latin has never ceased to be the dialect, and their power and influence gradually spread. The first threatened Tenton invasion was destroyed by Caius Marius (102 B.C.), and between 58 and 51 B.C. Julius Cæsar subdued the whole of Gaul, except the granite peninsula of the north-west. Later, refugees from Britain caused it to be called Brittany; and there to the present day the Celtic tongue has prevailed, and the habits have been peculiar. The Iberian or Basque tribes of the Pyrenees have likewise preserved their entirely different tongue, which is not even Aryan.

Roman habits, civilisation, and speech were adopted all over the country, and Christianity became nearly universal. Many cities were founded as centres of government from the conquered population, and most of the great cities such as Arles and Lyons and many others date from this time. Nimes and Vienne show splendid monuments of Roman architecture. The Romans also made magnificent roads, and are said to have introduced the olive and the vine, to both of which the climate is eminently suitable. Admirable, undecaying roads traversed the country, but there was continual warfare on the open frontier with the advancing Teutonic nations, of whom the Belgians, a mixed race, were the van. The city of Lutetia Parisiorum, now known by its tribal name, Paris, was the headquarters of Emperor Julian before his accession in A.D. 361, while he was struggling with these invaders. After his death, Gaul became a prey to the Teutons. They did not destroy the old population, but quartered themselves as guests on the proprietors of land; while the Roman cities kept up their self-government, and paid ransoms to escape pillage. The Goths were Arian Christians before their conquest; the Burgundians divided between Arianism and the Catholic faith; the Franks still worshippers of Odin, Freya, and Thor, but they were awed by the superiority of the Roman Gallic priesthood, and in about 482 Clodowig or Clovis, the King of the Franks, embraced Christianity.

His family was known as the Merwings, or Merovingians, as they were Latinised, from his father, also as the Long-haired, because flowing locks were the token of chieftainship. Their domain extended far into Germany; but they only subdued, and did not settle, in the country to the south of the Loire. Though nominally Christians, they were savage, ferocious, and untameable, and they brought their old hereditary Tenton customs of inheritance and chieftainship, which, as they had last come from the banks of the Yssel, were known as Salic laws—*i.e.* of the Salian Franks. Their German dominions were called Austreich (the eastern kingdom); their Gaulish Neaustreich (not Eastern) or Neustria; and both were Frankland. Their dynasty soon exhausted itself, and latterly their kings were called *Fainéants* or "Do-nothing" kings, while the mayors of the palace really governed.

One of these mayors, a Teuton wholly in blood, Charles Martel, in 721 checked the tide of Saracen invasion, and saved Gaul by the great battle of Soissons. His son, Pepin, in 753 was elected king, and thence descended the race known as Karlings. Charles the Great, called in French "Charlemagne," was one of the really great monarchs of the world. His dominions reached from the Ebro to the Channel, from the Elbe to the Atlantic, and included North Italy, and in 800 he was crowned by the Pope Emperor of the West. His power was too vast for a single hand of less power, and fell to pieces after his son's death. The Western Franks fell to Charles the Bald, and it was then (about 870) that France became a recognised term for the country between the Channel and the Pyrenees. The king had, however, very little power; his lands were cut up into divisions under dukes, marquises, and counts, who owned themselves his men in homage, and were bound to follow him in war, but ruled quite independently. Moreover, the Northmen or Danes were horribly ravaging the whole country; Paris was fortified against them under Robert the Strong, but in 911 King Charles the Simple found himself obliged to make to Rolf Ganger, the chief of the Northmen invaders, a grant of the Neastrian lands, which took the name of Normandy. The

Karlings finally were deposed in 987, and their representative retired to Lotharingia or Lorraine as duke. The grandson of Robert the Strong, Hugh, became king. He was called Capet, apparently from the hood which marked him as guardian of the Abbey of St. Denys; and the name is used for his dynasty, which reigned for eight hundred years. The German influences had passed away, though the king and nobility were of Frankish blood. The whole realm was parcelled out into feudal holdings, the great chiefs of which hardly owned the royal power, and the only place where the king really ruled directly was the county of Paris. There was much confusion and private warfare, and after the conquest of England in 1066, the Dukes of Normandy overshadowed the French kings. Louis IV. ("the Fat"), in 1108, was the first king of any ability. He judicially overcame a robber count, and in his time (though not on any fixed principles) cities began to be allowed to purchase their power of self-government, such as the southern ones had preserved from Roman times. This was called the right of *commune*. Except in these cities, the lot of the people of Gallo-Roman blood was wretched. They were called villeins, and, except that they were attached to the soil, were almost slaves, cruelly oppressed and downtrodden by their irresponsible lords, mostly Franks, who covered the land with fortified castles. There was, however, much religious zeal, which found its outlet in the Crusades, first proclaimed at Clermont, in Auvergne, in 1095, and in the religious orders, whose beautiful monasteries and splendid cathedrals still exist.

France was at its weakest under Louis VII., when Henry II. of England, by inheritance Duke of Normandy and Count of Anjou, had married the heiress of the great Duchy of Aquitaine, and obtained the heiress of Brittany for his son. Philip II., called Augustus, spent his life in undermining the power of the English kings, and when King John murdered his nephew, Arthur of Brittany, Philip held a court of justice, cited him thither, and, on his non-appearance, adjudged him to have forfeited Normandy and Anjou, which easily were conquered, leaving only Aquitaine as the possession of John's mother, and these lands, being held direct of the crown, much added to the royal power.

A strange heresy sprang up in the south, of which Albi was the centre. Freethinking habits led to much evil, and the violence of the period led it to be supposed that a crusade against the offenders as unbelievers was lawful. The war lasted for nearly thirty years, and involved the Count of Toulouse, whose lands were devastated, vines and olives cut down, villages razed, and all reduced to such a desert that it is said never to have recovered entirely. The heiress of the count married a brother of the king, and being childless, her county was added to the royal fief.

The king, Louis IX., was the best and most blameless of French sovereigns. It was he who, in 1258, established the Parliament of Paris. In every Teuton nation the king was supposed to take counsel and do justice among the other nobles and freemen; but to attend courts of law in a large territory was a great vexation to the nobles, who would not come, and yet resented decisions made in their absence. Louis arranged that though every immediate vassal of the Crown had a right to sit in it, yet in its working state it should only consist of men trained in the law, with just nobles enough to give it authority. In this Parliament the wills and edicts of the king, and the taxes he imposed, were registered, but it was never like the English Parliament, and could not originate. The provinces, likewise, had parliaments to serve as courts of law. Louis's devotion led him to attempt two unfortunate crusades, and he died in the second, in 1270.

His grandson, Philip IV. ("the Fair"), had a desperate quarrel with the Papacy, and by underhand means succeeded in forcing Pope Clement V. to act as his tool and reside in his dominions. The Popes fixed their residence at Avignon, in Provence, a province belonging to the Empire, and held at present by Philip's uncle, Charles, Count of Anjou, but near enough for French influence. Here the Papal court continued for seventy years. Philip V. was an evil, violent, and unscrupulous man, and the three sons who reigned in succession after him had not his force of character. Their sister, Isabel, had been the wife of Edward II., and the claim of her son, Edward III., to the succession caused the miserable Hundred Years' War. The French claimant, Philip VI., was son to a brother of Philip the Fair, and appealed to the old Frank or Salic law, which was said to exclude females. Wretchedness and spoliation prevailed all over France at intervals, worse almost for the peasants than warfare, since disbanded soldiers preyed on them ruthlessly. In the pitched battles the French were beaten, chiefly because the misery of their poor prevented them from having stalwart archers like the English; but they gained back the cities lost one by one, and the result was that, in spite of a succession of splendid victories, the English kings lost their ancient inheritance of Aquitaine, and retained only Calais, which had been taken by Edward III. in 1346. The sufferings of the peasantry had been dreadful. There had been one frightful rising of them in 1356 called the Jacquerie, because Jacques Bonhomme was the court name for the rustic; but they committed savage cruelties; the reprisals were shocking, and things were unaltered, except that in 1439 King Charles VII. succeeded in restraining the licence of the hired soldiery, and in forming the nucleus of a paid standing army. In 1378 the Pope returned to Rome, but as the Avignon Cardinals objected to the change, they elected antipopes, and the schism was only healed at the Council of Constance in 1418.

Humbert, the Dauphin or Count of Viennois, a small territory around the city of Vienne, belonging to the Empire, had, in 1349, died without heirs, leaving his fief to the eldest son of the French king, and Dauphin was thenceforth the title of the heir-apparent. The kingdom was nearly all in the king's hands, but there were still formidable feudal states, especially the old dukedom of Brittany and the dukedom of Burgundy, to which marriage and inheritance had lately united almost all the

Flemish and Dutch territories on the perilous corner of France, and mostly belonging to the Empire.

The reign of Louis XI. was a struggle with these princes and with the nobility (1461–1481). He was a hard and deceitful man, but sagacious, and one of the few statesman kings France has possessed. He favoured the cities, and encouraged trade, while he put down the risings of the nobles with a crafty and cruel repression. The Duke of Burgundy fell in a struggle with the Swiss, and Louis gained his French fiefs; also, by will, he obtained Provence, though this country remained a fief of the Empire. His son, Charles VIII., married the heiress of Brittany in 1491, and thus the kingdom had nearly reached its present extent. The next half-century, however, was distracted by the pretensions of the French kings to the kingdom of Naples and the duchy of Milan. Three kings—Charles VIII., Louis XII., and Francis I.—led armies into Italy to meet at first with brilliant success, and then be left to waste away between the climate and the Italian intrigues. These schemes, too, clashed with those of the House of Austria. The head of that family, Charles V., Emperor by election, united the kingdoms of Spain, and their claims in Italy, to the Netherlandish inheritances from the dukes of Burgundy, and there were thus incessant wars, and an enmity never appeased between France and Germany. This connection with Italy brought into France much art and cultivation, but often of a corrupt description, and the marriage of the son of Francis I. to Catherine dei Medici, a cousin of the reigning Pope, was one of the most fatal events in history through the evil influence she exercised.

The wars, the subjection of the Pope, the schism, and the Italian taste for pagan art and literature, had all conduced to great corruption and immorality alike in laity and clergy, and there was a terrible reaction when the Reformation spirit came in, in the reign of Francis I. The first French Bible was translated by Farel in 1525, but the character of the Reformation was fixed by Jean Chauvin, better known as Calvin, a native of Picardy, severely logical, and going to the farthest extremes of contradiction to the Papacy. Though banished from France, and spending his days at Geneva, his book of Institutes became the code of faith and morals of the Reformed in Holland, France, and Scotland. The iconoclasm of the reformers brought down vengeance on them; and, as Francis I. wished to stand well with the Pope, both he and his son, Henry II., sanctioned and even witnessed the burning of several victims. Henry's reign is noted for the recovery of Calais, in 1557, by the Duke of Guise, one of the Lorraine family, who thus acquired great influence. Henry's early death in 1559, while his children were all young, left his wife, Catherine, acting as regent, and trying to hold the balance between Guise at the head of the Catholic party and the numerous Reformed, or as they were called, for some uncertain reason, Huguenots, who demanded not only freedom of worship, but greater immunity from the oppressions of the crown. The reigns of her three sons, Francis II., Charles IX., and Henry III., were all one struggle between these powers, and the contest is known as the War of Religion, lasting forty years. Bloodshed and violence, profanity and desolation, stained the whole country. There were numerous battles, and many murders—among them that of Guise—and the crisis was when, on St. Bartholomew's Eve, August 24, 1572, Charles IX. was goaded into authorising a general massacre of all the Huguenots within reach of the young Duke of Guise and his followers. Hosts perished in the cities north of the Loire, but in the south the numbers were too large for attack. None of the sons of Catherine left children, and when the last, Henry III., was assassinated in 1589, the crown passed to Henry of Bourbon, descended in the male line from Louis IX. He was also King of Navarre, which little Pyrenean domain was thus added to the crown. He had been bred a Huguenot, and, though he joined the Catholic Church, he desired to keep an even balance between the two parties, and in 1598, by what was called the Edict of Nantes, he gave the Huguenots equal privileges with the Catholics. Under Henry IV., a man of personal charm, wide views, and solemn speech, and his great minister, the Duke of Sully, France began to recover and to commence her career of greatness; ruins were restored, the rivers connected by canals, trade flourished, and especially in southern France the culture of silkworms and the weaving of silk were encouraged. The generation of turbulent nobles, who had grown up during the wars of religion, were kept in check with a strong hand, but the mistake of attaching them to the court by creating highly-pensioned offices for them led to evil results. Henry was murdered in 1610, but after a short period of misrule his son's (Louis XIII.) great minister, Cardinal de Richelieu, carried on his policy, not beneficently but ambitiously. His hand was heavy on all internal resistance, and he devoted his whole soul to confirm the power of the crown and the country, and extend her conquests, while literature and art flourished under his encouragement. Cardinal Mazarin, though Italian by birth, pursued the same aims through the minority of Louis XIV., but there was a sharp struggle under him, known as the Fronde (q.v.), when the Parliament, backed by the nobles, made a last struggle for the remnant of liberty; but, as the nobles only acted out of personal jealousy of Mazarin, they soon deserted, and all resistance was at an end. Louis XIV. was a man of great ascendency of character, solely bent on personal glory and that of France. The earlier part of his long reign was brilliantly successful, and he nearly gained the object of French ambition—the frontier of the Rhine. Under his minister, Colbert, in spite of the heavy burthens imposed by the king's wars, his buildings, and the pensions of the nobles, who paid no taxes, the prosperity of the country advanced, and France was the most influential, as well as the most formidable, state in Europe, alike through power, literature, art, and general splendour. In 1685 Louis, a strong Catholic though often in collision with the Papal Power, repealed the Edict of Nantes, and by persecution drove into exile his most industrious subjects of the south, and crippled trade. The establishing his grandson on the throne

of Spain led to disastrous wars, and the victories of the English and Austrians were almost the ruin of France in his old age, and were only checked by the Peace of Utrecht in 1713, just before the end of his 71 years' reign in 1715, leaving the country exhausted and the people weighed down.

His great-grandson, Louis XV., exaggerated his personal faults without his redeeming qualities. The Court fell into a disgraceful state of immorality, the peasantry starved, and so jealous was the superintendence of the governors of provinces and their subordinates that no beneficent owner of estates could do anything for the peasantry without incurring suspicion, while even the few agriculturists who prospered by thrift, lived apparently in poverty lest they should bring on themselves the exaction of Government, or of their own seigneurs, for whom they were bound to give forced labour as well as to pay heavy dues. A spirit of strong reaction set in among the educated, not only against the Government, but the Church, which had only too much share in the oppressions and in the corruptions. Philosophy of the free-thinking kind and ideal classical liberty were in vogue, chiefly through the writings of Voltaire, Rousseau, and a number of others, called the Encyclopédistes. The pent-up misery of the country had become unbearable, and when Louis XVI. succeeded his grandfather in 1774, it was clear that there must be some relief. The king, a good but slow and undecided man, wished for it, but was feeble and helpless; and, indeed, things had come to such a state that only a man of giant power could have guided the course of the torrent. Space forbids giving the steps of the Revolution. It began with the first convoking of the States-General, the really popular assembly of representatives, which had not met since 1614, and then in vain. Thenceforward there was a succession of barriers thrown down; madness set in upon the long-oppressed people, who wreaked the vengeance of a thousand years. Frightful mobs rose upon all whom they connected with their past misery. Nobles and clergy fell; the king was dethroned, and in 1793 was executed. A Reign of Terror set in, during which Robespierre and other fanatics, who thought they must destroy in order to build up, sent to the beheading machine, the guillotine, thousands of victims, and hoped to have swept away even the Christian religion, together with all the old abuses of power. When they fell in 1794, less sanguinary counsels prevailed, and, after sundry attempts at forms of government, Napoleon Bonaparte, of Corsican birth, climbed to supreme power. His course had been through victories. There had been attempts to put down the Revolution and free the king on the part of the neighbouring nations; and these had been defeated by the French in the frenzy of their new emancipation, and thence they had gone on to further conquests of Switzerland, Holland, and Lombardy, through which Napoleon rose to be the idol of the nation, and in 1804 became Emperor of the French. Changes had been made throughout the country. The old provinces, which had vexatious separate jurisdictions, according to their original divisions, were broken up into departments, and uniformly governed. The tenants became possessors of their lands, but the law of primogeniture was abolished. The weights and measures were henceforth decimal divisions of the weight and circumference of the earth, and there was even an attempt to call the months by new names and to substitute decades of ten days for the week. A new and well-constructed body of laws, called the Code Napoléon, was set forth, and has been in force ever since, though Napoleon's ambition overreached itself. He had been victorious over every European country except England, and in 1812 invaded Russia and reached Moscow, but was forced to turn back from Moscow, and his Grand Army was nearly destroyed in the frightful retreat through a severe winter. The conquered nations rose upon him, his success deserted him, and in 1814 the Allies entered Paris. He was dethroned, and sent to the Mediterranean isle of Elba. Escaping, he rallied his old forces, but only to be defeated at Waterloo, and to be sent to spend the five remaining years of his life at St. Helena in the Atlantic.

Louis XVIII., brother of the late king, was restored, and both he and Charles X., the next brother, tried to restore as much as possible the old principles, but the nation disliked and distrusted them. Charles X. was narrow and imprudent. and in 1830 he was expelled by a revolution, and his distant relation, Louis Philippe, Duke of Orleans, became King of the French, as a constitutional sovereign. There was fair prosperity, thriving commerce, and manufactures, the navy was improved, and the conquest of the African territory of Algiers was begun; but distrust began to grow, and the democratic spirit chafed against the monarchy, peerage, and all the privileges of property. Another revolution, in 1848, expelled Louis Philippe and his family. There was a period of alarm and uncertainty, the mob of Paris being disappointed at gaining only equality of right, not of wealth. The apprehension felt by all respectable people caused the nephew of Napoleon I., Louis Napoleon Bonaparte, to be gladly welcomed as President; but in 1851 he used violence and bloodshed to sweep away all opposition to his re-election. The troops were turned in on Paris, and slew whom they would, till all opposition was silenced by this *coup d'état*. Thus in 1852 he obtained the Empire, and reigned for seventeen years, keeping the nation under a tight hand, but providing constant excitement and amusement for the populace, and declaring his empire to be of peace. However, he joined with England in the Crimean War, against Russia, and, for the price of the old Duchy of Savoy aided Victor Emanuel to drive the Austrians out of Italy. Jealousy of the Prussian power, and need of excitement for the nation, seem to have driven him into provoking a war with Germany, in which the French fancied they should obtain the coveted west bank of the Rhine for their frontier; but their army had deteriorated, and a succession of defeats ended in the captivity of the emperor. Paris rose, and declared him deposed, enduring in the winter of 1870 a most distressing siege by the Germans, and after the surrender, the populace, in a frenzied state, rose again, calling themselves the Commune,

and endured another terrible siege by the army under the friends of order. When no longer able to hold out, the Communards did their best to burn the city, and destroyed many of the fine old historical buildings. They suffered for their crimes under execution and banishment to New Caledonia, and the memory of those days is miserable.

Adolphe Thiers, the veteran statesman, restored order, and for twenty-two years France has had a republican constitution, with a seven-years' president, a ministry for the departments of Government, a Legislature of two Chambers (the Senate, with 300 members, and the Chamber of Deputies, with 584), and universal suffrage. All this time actual home administration has been practically carried on under the Code Napoléon, which has created an immense number of offices, all dependent on the Government at Paris, so that the centre absolutely commands everyone, from the mayor of a city to that of a parish, together with the dispensers of justice, and even keepers of tobacco shops; and thus all France is powerless to resist changes at the central seat of government. The bishops and clergy are likewise paid and appointed by Government, and at its mercy.

The army is recruited by conscription, to which all classes alike are subjected, every able-bodied male being obliged to serve for a certain number of years. Since the war of 1870–71 immense pains have been taken to raise it to the highest state of efficiency. It now numbers about 600,000 men. The navy, which attains a high standard of efficiency, consists of 400 vessels.

Ethnology. The present inhabitants of France are the outcome of numerous successive waves of migration and secular interminglings, which go back to neolithic times (men of the Polished Stone Age, contemporaries of the cave bear, mammoth, and reindeer), and, according to some authorities, even to the Tertiary epoch (men of the Palæolithic or Chipped Stone Age, contemporaries of the giant mastodon and elephas antiquus). But from a general consideration of the constituent elements of the population these rude cave-dwellers may be set aside as too few or too feeble to have appreciably affected subsequent generations. Nor need much account be taken of the few Phœnician and Greek colonists who had founded settlements on the shores of the Mediterranean some centuries before the new era, but who were nowhere numerous enough to leave any permanent trace of their presence on the surrounding populations. But before their arrival the land had already been long occupied by the direct successors, if not the descendants, of neolithic man—races associated with the introduction of bronze and later of iron, builders of pile dwellings in the lacustrine eastern regions, builders of dolmens, menhirs, and other monolithic monuments in the western districts (Brittany, Poitou, etc.). These lake-dwellers and dolmen-builders are, beyond doubt, largely represented in the present populations of France, though the attempts to identify them with any of the earliest Gaulish peoples known to history have led to no certain results. Such historic peoples are the *Ligurians* in the south-east, forming the transition to the primitive inhabitants of Italy; the *Aquitani* in the south-west as far north as the Garonne, akin to the Iberians of Spain, and surviving in the Basques of the Pyrenees [BASQUES]; the Celts, or Gauls, of the central region between the Garonne and Seine valleys, a branch of the Kymric division of the Celtic family [CELTS] surviving in comparative purity, especially in Brittany, Auvergne, and Savoy; lastly, the *Belgæ*, from the Seine to the Rhine delta, whose affinities have been much discussed, though Cæsar (*De Bell.*, ii. 4), states distinctly that most of them (*plerosque*) were German intruders who had crossed the Rhine in remote times (*antiquitus*), and driven out the Gauls. The term Gaul itself has been variously interpreted, though the same authority tells us that it was synonymous with Celt (i. 1). Thus the substratum of the French population is clearly shown to consist of four distinct elements, two of Aryan speech (Celts and Germans), two of non-Aryan speech (Ligurians and Iberians). Of these the Celts, or peoples of Celtic speech, were by far the most numerous, and had probably absorbed most of the others about the new era when they began themselves to be rapidly assimilated in speech and usages to their Roman masters. Numerous Italian or Latin-speaking colonies had been already founded in the *Provincia Romana* (Gallia Ulterior), long before Cæsar's conquest of the whole country, and after that event streams of migration continued to flow over the Alps until, towards the close of the Empire, the people might fairly be described as "Gallo-Romans." Then came the irruption of the northern barbarians, nearly all Teutons: Franks in the north, Burgundians in the east, and Visigoths (West Goths), who penetrated to the south-west (Aquitania). But although the Franks established two powerful empires (the Merovingian and Carlovingian), and also left their name to the land, none of these Germanic invaders exercised more than a local influence on the race, and all ultimately disappeared amid the Gallo-Roman populations. The same remark applies to the "Saracens" (Mohammedan Berbers and Arabs), who in the 8th century had reached as far as, and even beyond, the Loire, and in a less degree to the Normans, who had established themselves early in the 10th century (912) in the Seine valley, and who have certainly left their impress on the north-western populations. Since the 10th century France, with trifling exceptions (English in Guyenne, Flemings, Germans, Spaniards on the frontiers), has been free from the encroachments of foreign races, and the slow process of fusion in a single nationality, not yet completed, has thus been in progress for about 1,000 years. From the predominance of Teutonic elements in the north (Belgæ, Franks, Normans), and of Italic elements in the south (early and later Italian settlers in the Provincia) there resulted in mediæval times two great ethnical and linguistic divisions which shared the land between them in nearly equal proportions, and which still persist—*Celto-Teutons*, of *Langue d'oil* speech, in the north; *Celto-Romans*, of *Langue d'oc* speech, in the south. But since the political union effected by Louis XI. with Paris, the great centralising

capital in the north, the northern has steadily tended to encroach on the southern division, so that the time is approaching when an ethnical union of *Langue d'oil* speech (standard French) will also be effected. But pending this union, and pending the absorption of such tenacious, isolated groups as the Bretons, Auvergnats, Savoyards, and Basques, though there is a common nationality, we can scarcely yet speak of a common French type. Tall stature, dolichocephalic skulls, fair or light-brown complexions, grey or blue eyes, still prevail, as might be expected, in the north, for these traits are characteristic of Belgæ, Franks, and Norsemen alike; to them correspond short stature, olive-brown complexion, brachycephalic skulls, dark brown or black eyes in the south, and notably in the Cevennes and other hilly districts, where possibly a primeval non-Aryan element still survives. The tendency towards uniformity has proceeded at a much more rapid rate in the large towns than in the rural districts. Hence large urban populations, such as those of Marseilles, Lyons, Bordeaux and Paris, present far less striking contrasts than do the inhabitants of the old historical provinces, where may still be distinguished the loquacious and mendacious Gascon, the pliant and versatile Basque, the slow and wary Norman, the dreamy and fanatical Breton, the quick and enterprising Burgundian, the bright, intelligent, more even-tempered native of Touraine—a typical Frenchman, if there be any—occupying the heart of the land and holding, as it were, the balance between all the surrounding elements. Taken as a whole, the modern Frenchman stands somewhat intermediate between the southern and northern peoples, less steadfast than the Teuton, more energetic than the Italian, less personally independent than the Anglo-Saxon, hence betraying a lack of individual enterprise, most great movements being initiated by their rulers, whereas the opposite is the case in England—no French names to place by the side of the Hampdens, Penns, Howards, Wilberforces, Cobdens, and other marked personalities, leaders of great national, philanthropic, or colonial undertakings; no great French trading corporations comparable to the historical East India, Hudson Bay, and other more recently-chartered companies. The moral sentiment is also certainly defective, so also the love of show and glory is stronger than the sense of duty. On the other hand, the artistic sense is highly developed, while the purely intellectual qualities are far above the average, as reflected in the scientific and literary work of the nation, and in the cultivated language which within certain limits is almost an ideally perfect instrument of human thought. The Frenchman, and especially the Frenchwoman, excels also in conversational powers, and in all matters pertaining to taste, etiquette, tact and the social amenities, where brilliancy and vivacity find freer scope than the more solid qualities of the reasoning faculty. With more outward polish, French culture penetrates less deeply through the social strata than does the refinement of the cultured classes in England. At the same time, the substantial qualities of patience, economy, and love of labour cannot be denied to the French peasantry, who thus act as a counterpoise to the extravagance and frivolity of urban life. By hoarding their small savings, and by domestic thrift verging on the sordid, they have made France one of the richest countries in the world, better able than most others to survive tremendous catastrophes, and rise buoyantly from apparently overwhelming disasters. Thanks to these qualities, combined with a pronounced military spirit and love of conquest, the French people have played a leading part in the world's history since remote times, and have become an almost necessary element in the general progress of human culture. The population is nearly forty millions. [FRENCH LITERATURE.]

Francesca, PIETRO DELLA, an Italian painter, often known as PIERO BORGHESE, from the name of his native town, Borgo San Sepolchro, in Umbria. He was born probably about the year 1415, and died either in 1492 or 1494. He assisted Domenico Veneziano with the frescoes of Sant' Egidio, Florence, and probably also was engaged with him at Loretto. About 1454 he finished for the Duke of Rimini the series illustrating *The Legend of the Holy Cross* at Arezzo. At Urbino, where he made the acquaintance of Raphael's father, he painted for the Duke, *The Flagellation*. The National Gallery, London, contains three of his pictures, besides a portrait attributed to him. He was one of the earliest painters in oil, and left a treatise on perspective, copies of which are at Milan and in the Vatican Library. Among his pupils were Luca Signorelli, and perhaps Perugino.

Francia, IL (1450–1517), is the name by which the Bolognese painter, FRANCESCO RAIBOLINI, is commonly known. He was the son of a carpenter, and worked for some time as a goldsmith. His earliest work in painting resembles that of the Ferrarese school, but his later manner, of which there are some fine examples in the National Gallery, London, was founded on a study of Raphael, whom he may have known personally. Francia held the office of Master of the Mint at Bologna, where he was "reverenced as a god." Two of his sons were painters, and the works of Giacomo, who died in 1557, have often been attributed to him.

Francia, JOSÉ GASPAR RODRIGUEZ DA (1757–1840), the celebrated dictator of Paraguay, was born at Asunçion. Although he took the degree of doctor of theology, he soon became a lawyer, and had filled several official positions in his native town when the royal government of Paraguay was overthrown in 1811. As secretary to the revolutionary Junta, he made such good use of his position that when, after two years, a republic was established under the direction of two consuls, he became one of them. Having gained popularity by depriving the Spaniards of civil rights, he was named at first sole dictator for three years, and in 1817 secured supreme power for life. With the help of a secretary, he controlled the government in its minutest details, and by a system of espionage put down the slightest opposition to his person. Military executions were frequent, and heavy fines were the only alternative. Exportation was

forbidden and internal trade strictly regulated, while the dictator himself was an active cattle-dealer. His leisure hours were given to study, astronomy and French philosophy being his favourite reading. Like Louis XI., his chief counsellor was a barber, but Napoleon was the great object of his admiration, and he imitated him even in his dress. In spite of its harshness, Francia's government was popular, and he at all events saved Paraguay from the anarchy which prevailed in the surrounding states.

Francis, Sir Philip (1740–1818), was the determined enemy of Warren Hastings (q.v.), and has been maintained by Macaulay and others to have been the mysterious "Junius." He was born at Dublin, and was at St. Paul's school with Woodfall, editor of the *Public Advertiser*, in which the famous *Letters* appeared. At sixteen he entered the Civil Service, acted for a short time as amanuensis to the elder Pitt, and from 1762 to 1771 was a clerk in the War Office. Two years later he went to India as member of the Council for Bengal, where he steadily and acrimoniously opposed Hastings, by whom, in 1780, he was wounded in a duel. After his return to England he entered Parliament, took an active part in the impeachment of the late Governor-General, and identified himself with the advanced Whigs. He wrote many pamphlets somewhat in the style of "Junius," but never claimed the authorship of the *Letters*. [Junius, Letters of.]

Francis I. (1494–1547). This King of France was the son of Charles, Comte d'Angoulême, and Louise of Savoy, and succeeded his uncle, Louis XII., whose daughter he married, in 1515. He immediately set about the reconquest from Maximilien Sforza of the Milanese duchy, which he claimed through his mother. The Swiss mercenaries were defeated at Marignano, and Francis proceeded to Rome, where he concluded a concordat with Leo X. Having been an unsuccessful candidate for the Empire, he sought the aid of Henry VIII. against his rival, and the meeting at Ardres, called the "Field of the Cloth of Gold," took place in 1520. In the first war between Francis and Charles V., however, England took sides with the latter, and the French king, attacked on all sides, was defeated and made prisoner at Pavia in 1525. After renouncing his Italian possessions and the suzerainty over Flanders and Burgundy, Francis was released, but immediately recommenced the war. The Pope was taken prisoner and Rome sacked, but by the Treaty of Cambrai (1529) France got little better terms than before. Five years later, the "Most Christian King" renewed the war, with Solyman the Magnificent, Sultan of the Turks, as his ally. The treaty concluded at Nice for ten years lasted only four, and in his last war, though England was the ally of the Emperor, Francis was less unfortunate than he had been before. Charles V., defeated at Cerisolles, deserted his ally, and made the separate peace of Crêpy (1544), but war with England continued two years longer, Boulogne remaining in the hands of the latter at its close. Francis was indifferent in religious matters; he persecuted the Protestants in the Vaudois, but supported them in Germany. Though a typical Frenchman with his love of military glory and of gallantry, the Italian element in his character appeared alike in the shiftiness of his diplomacy and in his magnificent patronage of literature and art. He founded the Royal College of Paris and collected a fine library at Fontainebleau, beside building several palaces and filling them with the treasures of art. His portrait painted by Titian is in the Louvre.

Francis II. [Mary Stewart.]

Francis I. (1708–65), Emperor of Germany. [Maria Theresa.]

Francis II. (1768–1835), last Roman Emperor and first Emperor of Austria (Francis I.), was the son of Leopold II., whom he succeeded in 1792. His first act was to abandon his father's pacific policy by joining Frederick William II. of Prussia in a war against the French Revolution. The result was that by the Treaty of Campo Formio (1797) Austria gave up the Netherlands and Lombardy, but obtained in exchange the territory of Venice, with Dalmatia and Istria. After a short interval the war was renewed, with subsidies from England and troops from Russia, but Francis, defeated at Hohenlinden and Marengo, had to sign the Peace of Lunéville in 1801. A third attack on France ended in the disaster of Austerlitz (1805), after which Francis, finding even his nominal power in Northern Germany destroyed by Napoleon's organisation of the Confederation of the Rhine, voluntarily abandoned the title of "Roman Emperor Elect" (August 16th, 1806), ending thereby a succession which in theory had been unbroken since Cæsar, and abandoning a title borne by the Hapsburgs with few intermissions since the thirteenth century. He had already, in 1804, proclaimed himself Emperor of Austria. The crowning humiliation of the reign was reached in 1809, when, after Wagram, Francis had to give his daughter, Maria Louisa, in marriage to the usurper Bonaparte, besides ceding large portions of his dominions. From this time the Emperor entrusted the direction of affairs to Metternich, through whose policy he was able to throw off the alliance with Napoleon, and to more than recover his territorial losses.

Francis Joseph, Charles, Emperor of Austria and King of Hungary, was born in 1830, and, on the abdication of his uncle, Ferdinand I., in 1848, succeeded him. He took the field in person against the Hungarians, and, with aid from Russia, suspended their constitution and undid the work of the revolutionists. He was present at the battle of Solferino (1859), after which France and Italy compelled Austria to give up Lombardy. In 1864 Austria helped Prussia to deprive the Danes of Schleswig-Holstein, but two years later the allies quarrelled, and the headship of Germany passed from the former to the latter, who also lost Venice. In 1867 the Hungarian question was settled by the establishment of the dual monarchy and his coronation as King of Hungary, the personal popularity of Francis Joseph forming a strong unifying element. The aim of his subsequent policy has been the preservation of peace by the

conciliation of Germany and Italy and the formation with them of a Triple Alliance. Russia has been the main cause of anxiety, and, by the Treaty of Berlin, Austria was allowed by the Powers to occupy Bosnia as a counterpoise to Russian influence in the Danubian States. Francis Joseph's only son, the Crown Prince Rudolf, committed suicide in February, 1889, and the Archduke Francis Ferdinand then became heir-presumptive.

Francis Xavier. [XAVIER.]

Francis of Assisi (1182–1226), founder of the Franciscan Order, was born at Assisi of a family named Bernardone. His Christian name was really John, but he was called Il Francesco or "The Little Frenchman," from his knowledge of the Provençal language. Like Loyola, he had been a soldier before he became a saint; it was during a year's captivity at Perugia that he first turned his thoughts to a religious life. He exchanged clothes with a beggar, spent a month in a cave, praying, and finally abandoned all his possessions. Having left his father's house, he begged at the gates of monasteries, tended the lepers at Gubbio, and assisted with his own hands in the building of two churches. After some years he was joined by two fellow-townsmen, and in 1210, when there were eleven brothers, he drew up for them his threefold rule, consisting of vows of poverty, chastity, and obedience. Two years later, having received informally the Papal sanction, the seat of the Order was fixed at Santa Maria degli Angeli of Assisi. The number of brethren rapidly increased, there being in 1219 as many as 5,000. Missionaries were sent to all parts of Italy, and five devoted men lost their lives while preaching to the Moors. St. Francis himself, in 1223, preached before the Sultan of Egypt, and obtained for his Order the guardianship of the church of the Holy Sepulchre. After his return to Italy he is said, while praying on Monte Alverno, to have received upon his person the marks of the wounds of the Redeemer. Narrators of the legend place this occurrence in the year 1224. On October 4, 1226, St. Francis died; two years afterwards he was canonised by Gregory IX. He left behind him works, both in prose and verse, characterised by a tender simplicity and great love of nature. He is one of the most cherished saints of the Roman Catholic Church. [FRANCISCANS.]

Francis of Sales (1567–1622), the author of the *Introduction to a Devout Life*, was born at the castle of Sale, near Annecy, in Savoy. He entered the Jesuits' school at Paris in 1578, and afterwards studied civil law at Padua for seven years. Refusing a brilliant marriage, he took orders, and soon became a good preacher. After the great success of his mission (in which persuasion was liberally backed by stronger measures) among the Calvinists of Chablais, he was induced to accept the position of coadjutor to the Bishop of Geneva, on whose death he succeeded to his see. He declined several offers of French bishoprics and also a cardinalate, and laboured in his own diocese to the last. He died three days after Christmas in 1622, and was canonised by Alexander VII. in 1665, January 29 being appointed as his festival. His great work has been translated into numerous languages, and has always remained popular. Lives of him by Hamon, Perennes, and Mrs. Lear have been issued within recent years.

Franciscans, THE, a religious order founded in 1208 by Francis of Assisi (q.v.), and finally established by Pope Honorius III. in 1223. It rapidly grew in numbers, there being in fifty years nearly 200,000 monks and over 7,000 convents. At present there are about 100,000 Franciscans, who are governed by a general at Rome, "provincials" or heads of provinces, and heads of convents, who are called *custodes*. All these officers are elective. Novices are called "scholars;" priests are known as "fathers;" and the rest are "brothers." Besides the regular monks, there are members of the Franciscan Institute, who are called Tertiaries (members of the Third Order). These are not bound by the letter of the vows. They need not be celibate, and may hold property, but they must restore ill-gotten goods, and must not be extravagant or luxurious, and are bound to hear mass daily, to be reconciled to their enemies, and to devote some of their time to the sick and the ignorant. The vow of poverty has been something of a stumbling-block in the history of the Franciscans. One party observed the traditions of St. Francis in the letter, and, under the name of "Observantists," obtained a separate organisation from Leo X. The "Conventuals" or unorthodox section allow ornaments in their churches, and are permitted to hold property in the name of the Order. The Capuchins, another branch of the stricter section, deriving their name from their *capuche* or hood, were formed at the time of the Reformation, and increased rapidly after the Council of Trent. The "Barefooted Franciscans" sprang up in Spain under Peter of Alcantara, and obtained a new rule in 1555. There are also several orders of Franciscan nuns, one of which, the Clarissines, was founded by St. Clara, sister of Francis, in 1212, and is the second Order of St. Francis. As missionaries, the Franciscans have been very active from the first; they have convents all over the world. As theologians, they upheld free-will against the Dominicans, and in metaphysics they were Realists. Among their great names are St. Bonaventure, Cardinal Ximenes, Duns Scotus, and Roger Bacon. Lope de Vega was a tertiary. Sixtus V., Clement XIV., and other Popes belonged to the Order, as likewise did the authors of the *Dies Iræ* and *Stabat Mater*. In England the Franciscans, known as Grey Friars, were very active in the reign of Henry III., and founded monasteries at Canterbury and Northampton. At the dissolution of the monasteries they had 65 houses; there are now five, and fourteen in Ireland, besides Capuchin convents in both. Luke Wadding, an Irish monk, was the historian of the Order of St. Francis, and his work has been largely supplemented since his death (1657). The Grey Friars are sometimes called Minorites and Seraphic Brethren.

Franck, SEBASTIAN (1499–1542), one of the earliest German writers, was born at Donauwörth He was early converted to Protestantism, but was in 1531 compelled to leave Strasburg, because he had advocated religious toleration, which was then in favour with no party. He afterwards became a soapboiler at Esslingen, and a printer at Ulm. Having been expelled from the latter on account of his *Paradoxa*, he went to Basel, where he died. Franck was the author of a *Treatise Against the Horrible Vice of Drunkenness* (1528), *Chronica des Ganzen Deutschen Lands* (1538), and other works; and he printed a collection of popular proverbs in German in 1541.

Francke, AUGUST HERMANN (1663–1727), a German educational philanthropist, was born at Lübeck. He was Professor of Oriental Languages at Halle from 1692 to 1698, when he took the chair of theology. He founded there several schools and a seminary for training teachers, besides an orphanage. Poor children were given a religious education, and were also instructed in German, natural science, and technical knowledge, physical exercises being attended to besides. All these foundations are still in existence, and others in the shape of a gymnasium, two schools for girls, and a free school have been added. Francke was the pupil of Spener, and the teacher of Zinzendorf.

Francolin, any bird of the genus Francolinus, with 34 species, from Africa and the south of Europe, ranging eastwards to India and China. These birds are closely allied to the partridge (q.v.), and seem to connect that genus with the brilliantly plumaged pheasants and tragopans.

Franconia is the name now given to a district comprising three circles in the north of Bavaria. The adjacent countries received in 1806 part of the old circle of the Empire, which lay between Upper Saxony, the Rhine, Bavaria, and Bohemia. As the "Land of the Franks," it was looked upon as the centre of the Holy Roman (or old German) Empire, and was till 1501, when the circles were formed, composed of Eastern and Rhenish Franconia, the latter half ceasing henceforth to form part of the territory known by that name.

Francs-Tireurs ("free-shooters"), a name given to irregular infantry (originally bands of peasants) during the Franco-German War. They were at first not recognised by the Germans as belligerents, and, when captured, were shot; but were afterwards formed into a regular corps, and as such obtained a military standing.

Frangipani, an old Roman family, whose name is supposed to have been derived from the fact that one of them distributed bread (*frangere panem*) to the poor of Rome Cencio Frangipani deposed Pope Gelasius II. and set up Gregory XIII. as Anti-Pope, and Giovanni, Lord of Astura, captured Conradin of Suabia in 1268. A branch of the old Ghibelline house still survives in the province of Udine.

Frankenstein, the title of a work by Shelley's second wife, the daughter of William Godwin. The name of the man who, in the story, creates by his knowledge of science a monster which haunts him. The word has come to be used proverbially of a creation disastrous to its author.

Frankfort-on-the-Main, a city in the province of Hesse-Nassau on the right bank of the Main, and 112 miles S.E. of Cologne. From 1257 till the breaking-up of the old German Empire in 1806 it was a free city, and again from 1816 till 1866, when it was punished by a heavy fine for supporting Austria in the war, and made a Prussian city. The treaty which closed the Franco-German War was signed here on May 10th, 1871. The chief buildings of Frankfort are the Roemer, or town-house, built between 1405 and 1416, which contains the Kaiser saal, where the Emperors dined in state and where portraits of them from Conrad to Leopold II. hang; the cathedral, where they were elected and crowned; and the palace of the Prince of Thurn and Taxis, in which the North German Diet sat. As a commercial centre, the town is of great importance, and is the junction for seven railways, the central station being one of the finest in Europe. It was formerly celebrated for its fairs, but it is now chiefly important as a money-market, the firm of Rothschild being among its bankers. A new exchange was opened in 1879. Among its institutions are two conservatories of music and a public library. The suburb of Sachsenhausen, on the left bank of the Main, is connected with the city by seven bridges. By means of the rivers Main and Rhine there is direct water communication with the North Sea. Goethe, the greatest of Germans, was a native of Frankfort, and has a statue in one of its squares; and there is also a monument commemorative of the inventor of printing, Gütenberg.

Frankfort-on-the-Oder, a town in the province of Brandenburg, Prussia, 51 miles E.S.E. of Berlin. It was one of the Hause towns in the 14th and 15th centuries, and is still of commercial importance. Among its manufactures are machines, organs, chemicals, and paper; it has also tanneries and breweries; and three fairs are held in it every year. The town is situated on the Oder, and is connected by canals with the Elbe and Vistula. The university was founded in 1506, and in 1811 was incorporated with that of Breslau.

Frankincense, or OLIBANUM (*oleum Libani*), the gum-resin of several species of *Boswellia*, trees belonging to the order Burseraceæ. They have deciduous, scattered, imparipinnate leaves, and clusters of pentamerous flowers. *B. Frereana*, the "Yegaar," *B. Bhau-Dajiana*, the "Mohr Add," and *B. Carterii*, the "Mohr Madow" of Somali-land, and a variety of the last-mentioned, known as "Maghrayt d'Sheehaz," in Hadramaut, on the opposite Arabian coast, are the sources of true frankincense. The first-named is inferior. Frankincense is exported from Somali-land to Bombay, and thence to Europe, some 7,000 to 8,000 packages coming to London annually. It is in semi-opaque tears or lumps, yellowish or almost colourless, covered externally with white dust, bitterly aromatic in taste, and having a slight smell before being heated. It contains a gum, soluble in water, closely allied to gum-arabic, 72 per cent. of resin, soluble in

alcohol, a colourless essential oil containing *oliben* ($C_{10}H_{16}$), and an ash consisting mainly of carbonate of lime. It burns with a bright white flame, and is used in Arabia as an illuminant and for chewing. It has a stimulant action on the mucous membranes, is cheaper than balsam of Peru, and is useful as a fumigant in bronchitis; but it is mainly used as incense (q.v.). The name of common or European frankincense is applied to the resin of the Norway spruce (q.v.), *Picca excelsa*, and of *Pinus Tæda*; and in the United States that of *Pinus australis* is so called.

Franking was the privilege of sending and receiving letters without payment to Government. The origin of the practice probably was that the Post Office at first only transmitted official correspondence. Anyone, therefore, who occupied an official position, claimed in after days to share the benefit of it. Thus, in England in 1660 the Commons claimed it in granting the postal revenue. The privilege was not, however, expressly granted till 1764, when it was declared by statute that every member of either House was entitled to send out free 10 letters, of not more than an ounce in weight, every day, and to receive 15. The privilege was so much abused that in 1837 it had to be guarded by provisions that the member must write his whole address on the letter, which must also bear his name, the name of the post-town, and the date when it was posted; and that this last must be either the day on which it was written, or the next; moreover, the post-town must be within 20 miles of the franker's residence. With the introduction of the Penny Post in 1840 the privilege came to an end. In the United States franking was even more abused, and was not abolished till 1873.

Franklin, the freeholder who held his lands direct from the Crown. He seems to have held a good position in the time of Chaucer, among whose pilgrims in the prologue to the *Canterbury Tales* he appears. In later times his position appears to have been that of the superior yeoman.

Franklin, Benjamin, the great American natural philosopher and diplomatist (1706–1790), was born at Boston, Massachusetts, the youngest son of a large family. He was taken from school at the age of twelve to learn printing with his brother, James; and when the latter was imprisoned for libel, carried on his journal for him. Longing for independence, Benjamin, at the end of five years, left Boston, and sailed to New York; but ultimately went to Philadelphia, where he was employed by a printer. To gain further experience, he was persuaded to go to England in 1724, and was eighteen months in a London house. On his return he set up a printing business for himself, and a few years later began to conduct a newspaper. In 1732 he began to publish *Poor Richard's Almanac*, and five years later was made postmaster of Philadelphia. Soon after this he was elected to the Pennsylvanian Assembly, and became Deputy Postmaster-General for the colonies. In 1746 began the period of scientific research. He proved experimentally the identity of electricity with lightning, suggested lightning-conductors as a protection for buildings, and made other discoveries in physics, which gained him election to the Royal Society of London. He also laid the foundations of meteorology by his description of the course of storms over North America; pointed out the use which could be made of the thermometer in navigation; and in optics showed in what manner different colours absorbed solar heat. In 1757 he went to England as agent for Pennsylvania, and was there for five years. In 1764 he came over to represent the opposition of the colonies to the Stamp Act, and after a fruitless mission returned to America in 1775. He was immediately elected a delegate to Congress, and took an active part in its deliberations. He was now sent to Paris in order to obtain the help of France for the resisting colonists, and in 1778 saw his efforts crowned with success. He did not return to America till 1785, some two years after he had signed the treaty by which the independence of the United States was recognised. After having been thrice President of his own State and a delegate to the Constitutional Convention of the United Colonies, he retired from public life in 1788. Franklin's autobiography and writings have been edited by John Bigelow, who has also written a life of him. W. T. Franklin, his grandson, Jared Sparks, and James Parton are also among his biographers.

Franklin, Sir John, naval officer and Arctic explorer, was born in 1786 at Spilsby, Lincolnshire, entered the navy in 1800, served in the *Polyphemus*, 64, at Copenhagen, and accompanied Flinders in the *Investigator* to Australia. Returning home in the *Earl Camden*, he was present at Dance's famous action, and in 1805 he fought in the *Bellerophon* at Trafalgar. He was made a lieutenant in 1808, and served during the rest of the war in the Low Countries and America. His first voyage of discovery was made in 1818, when, in command of the *Trent*, he accompanied Buchan's expedition towards Spitzbergen. In 1819 he was given command of a perilous overland expedition from Hudson's Bay towards the mouth of the Coppermine river, and travelled 5,550 miles, not returning to England until 1822. In his absence he had been made commander in 1821, and upon getting home he was made captain. He published an account of his adventures in a *Narrative of a Journey to the Shores of the Polar Sea*. In 1825 he was despatched to co-operate with Beechey and Parry in the search for a north-west passage. This voyage provided material for his *Narrative of a Second Expedition to the Shores of the Polar Sea*. On his return he received many honours and rewards, and was in 1829 knighted. From 1830 to 1834 he commanded the *Rainbow*, 28, in the Mediterranean, and he was subsequently Lieutenant-Governor of Van Diemen's Land. In 1845 he was despatched in the *Erebus*, with the *Terror* in company, on a renewed search for the north-west passage through Lancaster Sound and Behring Strait. After July of that year the expedition disappeared from civilised ken. In three years England became very anxious concerning it, and thenceforward for

many years search expeditions, both public and private, were sent out. These expeditions discovered many interesting facts, but learnt little of the fate of Franklin, until in 1857–60 Captain (afterwards Sir) Leopold M'Clintock, in the yacht *Fox*, ascertained conclusively that Franklin had died, that the vessels had afterwards been abandoned in ice near King William Sound, and that all the officers and crew had perished in their endeavours to reach the Great Fish river. Franklin's death occurred on June 11, 1847; but, owing to the doubts and hopes concerning him, his name was not removed from the Navy List until after 1852, when it appeared as that of a rear-admiral. Sir John had married in 1823 Miss Eleanor Anne Porden, and, a second time, in 1828 Miss Jane Griffin. The latter lady, a most devoted wife, spared neither expense nor exertions to discover tidings of her distinguished husband; and the *Fox*, which finally cleared up the sad mystery, was but one of several vessels that went out at her cost. Lady Franklin died in 1875 at the age of 75. It should be added that the later researches of Hall (1871–73) and Schwatka (1880) have borne out the information which was obtained by M'Clintock, and that these, as well as other travellers, have succeeded in securing many pathetic relics of the lost expedition.

Frank Pledge, called also FRITHBORH and TENMANNETALE (in the north), an association of 10 men, under the headship of a Capital Pledge, who were to be securities for each other to the law. If unable to produce any one of their number when duly called upon, they were liable to make good any injury he had done, provided they were unable to disprove their complicity. The principle was probably to substitute an artificial tie for the natural one of the family, which had become loosened. Frank-pledge is first described in the so-called laws of Edward the Confessor; but it grew up naturally from the law of Æthelstan, re-enacted by Edgar and Knut, that every man should have a security for him.

Franks. [FRANCE.]

Franz, ROBERT (1815–1892), a German musical composer, was born at Halle, in which town, while his health lasted, he held various appointments. Having studied under Schneider at Dessau, he published in 1843 twelve songs, which won the approbation of Mendelssohn, Schumann, and other masters. He produced altogether 250 songs, many of them of a high degree of merit, besides a *Kyrie* and arrangements of Handel and Bach. In 1872 a series of concerts were arranged for his benefit under the patronage of Liszt and Joachim, and were highly successful. He died in October, 1892.

Franz-Josef Land, an Arctic archipelago between lat. 80° and 83° N., discovered and partly explored by Payer and Weyprecht in 1873–74. Welczeckland on the E. and Zichyland on the W. are divided from one another by Austria Sound. Flat-topped basalt mountains, usually sheeted with ice, and rising to 5,000 feet, cover the surface of the archipelago. Animal life is abundant, and in summer the coasts are open. Franz-Josef Land was further explored in 1880–82, and has been looked upon as a good base from which the North Pole may be reached.

Franzos, KARL EMIL (b. 1843), an Austrian novelist, son of a Polish Jew, was born in Russian Podolia, and educated at Czortcow, Galicia, which he left to study law at Gratz and Vienna. For a few years he practised at the bar in the Austrian capital, but subsequently supported himself by journalism. He gave a popular description of his travels in *Semi-Asiatic Life: Pictures of Civilisation in Galicia, the Bukowina, South Russia, and Roumania*, and wrote many novels dealing with Jewish life. Chief among these are *The Jews of Barnow*, translated into English by M. W. Macdonald in 1882; *For the Right* (translated in 1887); and *Tragische Novellen* (*Tragic Tales*).

Fraoucen (AIT-FERAUSEN), one of the chief Berber tribes in Great Kabylia, province of Algiers, Algeria. They are members of the powerful Beni-Raten confederacy, and dwell E. of the Beni-Raten proper, in the Sebau basin and the surrounding hills. The tribal name *Fraoucen* has wrongly been identified with "France," giving rise to a local tradition of their French descent. It is really of great antiquity, occurring in Pliny under the form *Pharusii*, a Gætulian tribe; and, according to Hanoteau, they are the *Fraxinenses* mentioned in some Numidian inscriptions. Since the third century they have occupied their present territory, where they number (1890) about 8,000 souls.

Fraser, JAMES, D.D. (1818–1885), second Bishop of Manchester, was at Shrewsbury under Dr. Butler and Dr. Kennedy; as a scholar of Lincoln College gained the Ireland scholarship at Oxford, and held a fellowship at Oriel from 1840 to 1847, when he was ordained and appointed to a college living. He was a member of two Royal Commissions on Education, and in 1865 was sent to report on the American system. He also assisted in the inquiry of 1867 relating to the employment of women and children in agricultural work. Appointed Bishop of Manchester by Mr. Gladstone in 1870, he won universal respect in spite of his conflict with the Ritualists, and in the industrial struggle of 1877–79 acted as mediator. His life was written by Thomas Hughes (1887).

Fraser River, in British Columbia, rises from several heads in the Rocky Mountains, between long. 115° and 119° W., and lat. 55° and 54° 30′ N. One main branch flows north-west and the other south-east, till they meet at Fort George (lat. 54° N., long. 122° 45′ W.), from which point the united stream flows to the south, and after a course of between 700 and 800 miles, falls into the Georgian Gulf, south of Vancouver Island. There are rich gold beds in the lower basin of the river, which is navigable for about 100 miles, and large quantities of salmon are taken from it. At Yale begin the rapids, and the scenery for some distance is very fine.

Fraticelli (*Fratres Minores*, Little Brothers) was originally the name which the people gave

to the Franciscans (q.v.). It was next applied to the stricter section of that order; but it was ultimately used to designate a party of seceders from the Roman Church. Pope Celestine V. granted to the Fraticelli a separate organisation; but Boniface VIII. suppressed them. Thereupon they declared the Head of the Church an apostate. They gained strength by further secessions, and rejected all attempts at conciliation. They refused to recognise the authority of the Church, and held peculiar doctrines—such as the unlawfulness of oaths, and the forfeiture of spiritual authority through sin. They suffered much persecution, and continued to exist till the end of the 15th century. In 1374 there was a public discussion at Perugia between them and Paolucci, a Franciscan monk. The Fraticelli paid almost divine honours to St. Francis, but were supposed to accept the works of Joachim of Flora, a Benedictine, as their gospel.

Fraud. The term "fraud" is used in very many senses, but one incident common to all of them is the obtaining, or attempting to obtain, pecuniary or other advantage by unfair means.

1. *Actual fraud* is where one person causes injury to another by suppressing or misrepresenting a material fact which, from the circumstances of their relative position, he was bound to explain or disclose. This kind of fraud is sometimes designated "moral," as distinguished from legal or constructive fraud. The effect of this description of fraud is often countervailed by the conduct of the defrauded person, as, for instance, where he has not relied on the representation or misrepresentation, or where he has shown gross negligence.

2. *Constructive or legal fraud* applies to cases in which a court will enforce or set aside a transaction in which it is of opinion that it is wrong for a person to avail himself of the advantage he has obtained. This class of fraud sometimes exists where no wrongful intention is proved.

3. *Fraud on third persons* exists where one enters into agreement or obligation with another, and simultaneously or afterwards acts without his knowledge in such a way that the benefit of the agreement is partially or wholly lost to him.

4. *Fraud by statute.* Certain acts are made frauds by Act of Parliament. Thus, by the "Companies Act, 1867," a prospectus which does not comply with the requirements of the Act in specifying all contracts entered into by the company, or promoters, trustees, or directors thereof, before the issue of the prospectus, is to be deemed fraudulent. This is a case of legal fraud in which proof of fraudulent intention is not required.

The effect of fraud generally entitles the injured person to avoid the particular transaction in which it occurs.

5. *Criminal fraud.* There are also certain frauds dealt with by the criminal law, under which they are constituted misdemeanors; such are frauds committed by public officers in discharge of their duties and affecting the public, frauds committed by trustees, directors, and other officials.

Fraunhofer, Josef von (1787–1826), the discoverer of the dark lines in the sun's spectrum which bear his name, was born at Straubing, Bavaria. In 1818 he became manager of an optical institute, at which he had been employed for some years. It was removed from Benediktbeuern in 1819 to Munich, where, four years later, Fraunhofer was made professor and conservator of the physical cabinet of the Academy of Sciences. Besides the discovery mentioned above, he was the author of several inventions and improvements in optical instruments and the mechanism of large telescopes, and made the great telescope at Dorpat.

Fraunhofer Lines are dark lines crossing the solar spectrum or that of any other source of mixed light that is partially screened by an intervening gaseous medium. The simple spectrum of sodium gives two characteristic yellow lines close together. If white light containing that yellow be passed through a prism, it will be split up and will exhibit in a band the range of colour from red, through yellow, to the violet. But if the same light be surrounded with sodium vapour, that special yellow constituent of the mixed light will be absorbed in the gaseous envelope and will be absent from the spectrum, two black lines occupying exactly the same positions that the bright yellow held previously. Experiments of this kind have conclusively shown that the Fraunhofer lines indicate the substances present as gas in the intervening medium. In the case of the sun, this medium is the gaseous envelope surrounding the denser mass within. It is seen by the multitude of lines in its spectrum to contain many of the substances present on earth, such as sodium, potassium, calcium, iron, gold, silver, etc. The same principle is employed to compare the compositions of the various stars or other heavenly bodies that emit light. [Spectrum Analysis.]

Frechette, Louis Honoré (b. 1839), Canadian writer, born at Levis, Quebec, was called to the bar in 1864, and ten years later became a member of the Dominion Parliament. He has written poems (*Mes Loisirs, Les Oubliés, Voix d'Outre-mer* [1886]), plays, and other prose works. Two of his poems were crowned by the French Academy in 1880.

Freckles (*ephelis* or *lentigo*), small pigment spots which occur in fair people, usually on the face or backs of the hands. They are never found in very young children. They are popularly supposed to be produced by the sun, and are certainly more marked in summer than in winter. They are of no evil import, but on account of the disfigurement they sometimes cause various lotions have been employed with the object of effecting their removal. It is very doubtful whether such applications are of any value.

Fredegonde (d. between 596 and 598), Queen of Neustria, is notorious for her many crimes. She became the wife of Chilperic I., after she had obtained the repudiation of his first wife, and the death of Galesuinthe. The latter was sister of Brunhilda (q.v.), wife of Sigebert, who had suggested her to his brother as second wife. When war broke out between the brothers, Fredegonde put an end to it by the assassination of the King of

Austrasia. Others of her victims were Mérovée, who had married the widow; Andovère, his mother, first wife of Chilperic, and finally her husband himself. Brunhilda she pursued relentlessly, but could not take her life.

Frederick, the name of seven Danish kings. FREDERICK III. (1609–70) was granted absolute power by the Diet in 1660, after which the crown became hereditary in his family. FREDERICK IV. (1671–1730) was engaged in a lifelong war with Sweden, whose territories in North Germany he invaded. FREDERICK V. (1723–66) increased the trade of Denmark by the establishment of an Asiatic Company and by making the American trade free to all his subjects; while he also encouraged the arts and sent an exploring expedition to Egypt and the East. FREDERICK VI. (1768–1839) came to the throne in 1808, after having been Regent some years, during which time he joined the Armed Neutrality and the Continental System, and saw his capital bombarded in consequence. He supported Napoleon throughout, and had to cede Norway in 1814 to Sweden. In his reign serfdom was abolished, and the slave trade in Danish colonies prohibited. FREDERICK VII. (1808–1863) succeeded Christian VIII. in 1848, had to acknowledge the independence of Schleswig-Holstein, and abandoned the Sound dues for a sum of money.

Frederick, 5th Elector-Palatine (1596–1632), married Elizabeth, daughter of James I. of England, and was encouraged by him to accept the crown of Bohemia in 1619. He became head of the German Protestants, and the Thirty Years' War followed. He was driven out of Bohemia in a single winter, and put under the ban of the Empire, and the Palatinate went to Bavaria till the Peace of Westphalia.

Frederick, PRINCE OF WALES (1707-51), was the eldest son of George II. and father of George III. As George II. had quarrelled with his father, George I., in like manner Frederick quarrelled with George II., and became the head of the Opposition to his Government. This pitiful figure was the model for Bolingbroke's "Patriot King."

Frederick I., called "BARBAROSSA" (d. 1190), Emperor of the Holy Roman (Old German) Empire, was born between 1121 and 1123, and succeeded his uncle, Conrad III., in 1152, having been Duke of Suabia since the death of his father in 1147. After subduing several towns in Lombardy, he was crowned at Rome in 1154. Four years after he took Brescia and Milan, and at the Diet of Roncaglia was acknowledged as suzerain by the Lombard towns. His vassals and the Popes continued, however, to give him trouble in Italy, and even after the fortifications of Milan had been razed (1162) fresh revolts broke out. His defeat at Legnano (1176) induced him to adopt a policy of conciliation. He acknowledged Alexander III. as Pope in the following year, and in 1183 Italy was finally pacified. In the intervals of his wars with the Popes and his Italian subjects, Barbarossa had to encounter opposition in Germany. This he triumphed over by a mixture of firmness and conciliation. He made Austria a duchy and Bohemia a kingdom to please their rulers, but he reduced to submission Henry the Lion of Bavaria, and asserted his feudal superiority over Poland, Hungary, Denmark, and Burgundy. He had in his youth been on crusade, and in 1188, when an old man, he once more took the cross. He never, however, reached Palestine; for, having defeated the Moslems at Philomelium and Iconium in Asia Minor, he was drowned while crossing a river in Pisidia. Frederick Barbarossa is one of the greatest national heroes in Germany, and there is a legend that he is still sleeping in the mountains of Thuringia, and will awake to deliver the Fatherland in the hour of her need.

Frederick II. (1194–1250), grandson of Barbarossa, and son of the Emperor Henry VI., was born near Ancona. His mother was heiress of Sicily, of which Frederick was acknowledged king by her submitting to the feudal superiority of the Pope. Innocent III. also favoured him by excommunicating Otto IV. in 1211, when he became Emperor. With the succeeding Popes, however, his relations were very different. Though he was crowned at Rome in 1220, the Emperor delayed for some years his promise to take the cross, in order to subdue the Italian nobles and his Sicilian subjects, and in 1227 was excommunicated by Gregory IX. for returning under plea of sickness. Next year, however, he at length arrived in the East, extorted from the Sultan of Egypt Jerusalem and the holy places, and crowned himself king of the city with his own hand. Having made a truce for ten years, he returned to Europe in order to oppose the Pope's designs in the south of Italy. Revolts followed in Lombardy and Germany, the latter headed by the Emperor's own son Henry, supported by the minister Peter de Vincis, and in 1239 Frederick was again excommunicated. In 1245 his subjects were absolved from their allegiance by Innocent IV., and a year after the capture of his only supporter, his natural son Enzio, he himself died. His object had been to reduce the Popes to their original spiritual functions, and he failed. That he was one of the greatest princes of the Middle Ages there can be no doubt; and he was no mere warrior or even statesman. To his contemporaries he was the wonder of the world, and the marvellous transformer! He spoke all the languages of his Empire, was the earliest of the Italian troubadours, and a student of natural science. He tolerated Jews and Mahometans, though he persecuted heretics. He founded universities at Vienna and Naples, and encouraged poets and artists. His ideal was an intelligent autocracy, based on a uniform code of laws giving security to the mercantile classes, who were, however, to have no political power. He was licentious and cruel, but not ungenerous. By his enemies he was accused of being an atheist. He married, in 1235, Isabella, daughter of John, King of England.

Frederick III. (1415–1493), son of Ernest, Duke of Austria, was elected King of the Romans in 1440, and crowned Emperor and King of Lombardy twelve years later. In the course of a long and apparently disastrous reign he lost Hungary, Bohemia, and Milan. Notwithstanding this, he

laid the foundation of the future greatness of the Hapsburg house by marrying his son Maximilian to Mary of Burgundy, their descendants almost realising his device, "*Austriæ est Imperare Orbi Universo*" ("It is the fate of Austria to rule the world").

Frederick I., King of Prussia (1657–1713), was born at Königsberg, and succeeded his father, Frederick William (q.v.), in the electorate of Brandenburg in 1688. He increased his territory by purchase, and was rewarded for his support of the grand alliance against France with the title of first King of Prussia, which he assumed in 1701.

Frederick II., called *the Great* (1712–1786), whose father was Frederick William I. (q.v.) and mother Sophia Dorothea, daughter of George I. of England, was born at Berlin. In his youth he fell into great disgrace because he wished to devote some of his time to other things beside those military exercises which the king considered as the whole duty of a prince. So harshly was he treated in consequence that in 1730 he concerted with his friend Lieutenant Katte an escape to England. The result was disastrous; Katte was executed, and the young prince, barely escaping with his life, was imprisoned at Küstrin. Frederick soon thought it best to submit, and was rewarded by being allowed more freedom in the little court at Rheinsberg, where he resided after his marriage in 1733 with the Princess of Brunswick-Wolfenbüttel. Here he corresponded with Voltaire, studied other French writers, and composed music. On May 31st, 1740, he became king, and soon showed that his studious tastes had not unfitted him for the sterner pursuits of an ambitious ruler. Frederick William had left him a highly-efficient army and a carefully-hoarded treasure. With these he immediately began his long struggle with Austria. After a short and sharp campaign, he gained possession of the greater part of Silesia by the treaty of Breslau (1742), and in a second war (1744–45) obtained the rest. Frederick had already shown himself to be at least as great a commander as any of his ancestors; and in the Seven Years' War, which followed after eleven years' peace, he displayed extraordinary ability. Instead of having to fight with a young princess taken by surprise, and but faintly supported by her own subjects, with her hereditary foe as his ally, he had now to defend his own dominions against the combined attack of Austria (with the Empire at her back), France, Russia, Sweden, and Saxony, England alone affording him some slight diversion from the west. The victories of Rossbach (November, 1757) over the French, Leuthen (December, 1757) over the Austrians, Zorndorf (August, 1758) over the Russians attested his prowess, and he showed marvellous fortitude and resource after the terrible disasters at Hochkirchen (October, 1758) and Kunersdorf, 1759). In 1762 circumstances delivered him from the enmity of the northern powers, and the Peace of Hubertsbourg (1763) secured his position. He gained a further increase of territory in the first partition of Poland (1772) and in the Bavarian campaign of 1778, and had at his death raised Prussia from a second-rate to a first-rate power.

As regards internal government, he encouraged manufactures by a heavy protective tariff and by welcoming skilled artisans from other countries; while he attended himself to the minutest details of administration. The legal system was thoroughly organised, and Frederick saw that justice was done to all his subjects. A large measure of toleration in religion was granted. The strength of the army was increased, and the finances were carefully nursed. Taxation was remitted where it was seen to be too great a burden. By the formation of the Fürstenbund ("League of Princes") in his last years, Frederick assumed the position of head of Northern Germany, and began the process which ended in 1866, when Prussia took the place of Austria as first German power.

Frederick the Great was popular in England, which he visited in 1744, as "the Protestant hero;" but he was in reality a Deist, strongly imbued with the writings of the *philosophes*. In fact, he was thoroughly French, always using that language in his writings, and utterly neglecting German literature. His works fill thirty-one volumes, and consist chiefly of historical memoirs. An edition of his *Political Correspondence* was published at Berlin in 1878. He was undoubtedly the greatest monarch of the 18th century; but his success cannot blind us to the unscrupulous ambition, as well as ingratitude (for to her father he owed his life) of his attack upon Maria Theresa, or to the meanness of his personal conduct towards Voltaire. There are long German biographies of Frederick by Preuss, Droysen, and Kugler, the last of which has been translated; while his life may be read in English in the *Life* by Carlyle, the history of his reign by Tuttle (1888), and in one of Macaulay's *Essays*.

Frederick III., King of Prussia, and second Emperor of Germany (1831–1888), was the son of the Emperor William I. (q.v.) and the Empress Augusta. He was born at Potsdam, and educated by Dr. Curtius and the Rev. W. Godet, while he afterwards studied at Bonn, and travelled. Moltke was his teacher in things military. In 1858 he married the Princess Victoria, eldest daughter of the Queen of England, soon after which he began to take part in public affairs. Thus in 1863 he wrote a letter of protest to his father against the measures of Bismarck (q.v.) dealing with the army and the press. He began his military career in the Danish War, and in the war of 1866 with Austria commanded the Second Army, whose base of operations was Silesia. In the Franco-German War, the Crown Prince, in command of the Third Army, won the victory of Woerth, and took part in the battle of Sedan and the siege of Paris. He had much to do with the formation of the new German Empire, and was Regent during the illness of his father in 1878. He was present at the Jubilee celebration in London in 1887. In March, 1888, he became Emperor of Germany, but was cut off in his prime on June 15th by cancer in the throat. The Emperor Frederick did not work harmoniously

with Bismarck, who threatened to resign if he did not abandon the marriage which he proposed between his daughter and Prince Alexander of Battenberg. His views were more constitutional than those of any preceding Prussian king; he was opposed to the persecution of the Jews, and he shared in the liberal religious opinions and literary tastes of his wife. He has been called "Frederick the Noble."

Frederick Charles, PRINCE (1828-85), was the nephew of the Emperor William through his father and of the Empress Augusta on his mother's side. He commanded the right wing of the Prussian army in the Danish War of 1864, won the battle of Sadowa in 1866, and, as head of the Second Army in the Franco-German War, conducted the operations which led to the surrender of Metz, after which he defeated the attempt of Chanzy to relieve Paris from the south. He was called the "Red Prince" from the colour of his favourite uniform. The Duke of Connaught married one of his daughters.

Frederick William, Elector of Brandenburg, called "The Great Elector," (1620–88) was the first great man of the Hohenzollern family. Becoming Elector in 1640, he devoted his early years to repairing the ravages caused by the Thirty Years' War. By the Peace of Westphalia (1648) he lost part of his dominions, but in 1657 he secured the freedom of the duchy of Prussia from Poland. During the years 1672–79 he was engaged in a war with France and Sweden, and, though he drove the latter from Brandenburg, he was deserted by his allies, and obliged to pay an indemnity to Louis XIV. Nevertheless, at his death he left Brandenburg in the position of second German state, with a small but highly-efficient army, sound finances and the germs of trade. He revenged himself on France by receiving 20,000 refugees, who left her after the revocation of the Edict of Nantes, and who brought with them their industrial skill. He encouraged agriculture, opened canals, and set on foot a postal system. The royal library at Berlin was his foundation, and the capital of Prussia owes much to him besides. In religious matters he was tolerant. To sum him up, he was an earlier type of Frederick the Great.

Frederick William I., King of Prussia (1688–1740), the father of Frederick the Great, and the son of Frederick I., came to the throne in 1713. The first seven years of his reign were occupied in war with Sweden, from which power he gained Stettin at the peace; but during the remainder he was able to collect and drill tall soldiers without having to risk their precious lives. All his energies were employed in this, and in accumulating that hoard which his son afterwards found so useful. He was a mere martinet; but a martinet at the head of 80,000 men was invaluable to the rising kingdom of Prussia.

Frederick William II. (1744–97), nephew and successor of Frederick the Great, inherited none of his qualities. He dissipated the treasure left him by his uncle in a war undertaken in favour of his brother-in-law, the Stadtholder of Holland, and alienated his subjects by heavy taxation and by interference with freedom of thought and religion. He gained territory, including the long-coveted Dantzic and Thorn by the second and third partitions of Poland (1793–95), but he was unsuccessful in obtaining any from France as he had hoped to do by attacking the revolutionary government.

Frederick William III. (1770–1840), son and successor of the last-named, was an amiable man, but not an able ruler. Up to the year 1806, partly owing to jealousy of Austria, partly to the hope of obtaining Hanover, and partly from natural timidity, he took no part in the coalitions against Napoleon. When he was at length forced into action by the indignation of his subjects at the violation of their territory, and by the spirit of his Queen (Louise), it was too late. Prussia, with a disorganised army and alone, was speedily crushed at Jena and Auerstadt, and was brought lower than she had been for a century. After a time, however, the army was secretly reorganised, and Stein (q.v.) was summoned to advise on civil matters; so that when the Russian campaign had brought down the pride of Napoleon, Prussia was ready to join with the Allies in the War of Liberation. Frederick William, as a true Hohenzollern, accompanied the army in person, and at the end of the war not only recovered his lost possessions, but gained part of Saxony, Jülich and Berg, and Swedish Pomerania. The peace was followed by a short period of reform; but from the year 1818 arbitrary government prevailed in Prussia, as in Austria, and, to some extent also, in France. Frederick William joined the Holy Alliance; assisted Russia to suppress the rising of the Poles; and suppressed freedom on the platform and in the press. He was a well-meaning and hard-working, but weak king.

Frederick William IV. (1795–1861) was the eldest son of Frederick William III. He was carefully educated, and became a well-read man, with some taste for art and oratorical ability. When he came to the throne he called the constitutionalists Eichhorn and Boyen to his councils, but soon disappointed the hopes which the Liberals had formed of him. In 1847 he refused a written constitution, but yielded to the revolutionists of 1848. Next year he wisely rejected the Imperial crown offered him by the Frankfort Assembly. In 1850 he promulgated the Prussian Constitution, but always evaded a liberal interpretation of it. In foreign affairs he leaned towards Russia, having a great regard for the Tsar Nicholas, his brother-in-law. In 1857 he became insane, and the Regency was entrusted to his brother William, afterwards King and Emperor.

Frederickshald, a fortified town on the coast of Norway, eighty-five miles S.S.E. of Christiania. It was formerly called Halden, but takes its present name from Frederick III. of Denmark. It was burnt down in 1826, and has been rebuilt with broad streets in the modern style. The timber trade employs the inhabitants. Charles XII. of

Sweden was killed (1718) while besieging Frederiksteen, situated to the south-east of the town.

Free Church of England, THE, a small body of Evangelicals who separated in 1844 from the Anglican Church, as a protest against the Tractarian movement.

Free Church of Scotland, THE, is an offshoot of the Established Church, formed by the disruption which took place in 1843. Patronage had been restored in 1712, though the "call," or actual election as pastor, was still to be in the hands of the parishioners. This, however, was merely nominal, since nomination by the patron gave a right to the emoluments of the benefice, and a very small number of the congregation could then make the election of a pastor. In 1834 the General Assembly of the Church passed a Veto Law, which laid down as a fundamental doctrine that no minister could be intruded into a parish against the will of the church members, and declared that a majority of male heads of families, being full members of the church, should be able to prevent such intrusion of a presentee. Litigation followed, and came to a head in the Auchterarder case, where the majority of the parish had been opposed to the call of a presentee made by two heads of families. The Court of Session declared the appointment legal under the Patronage Act, and was upheld by the House of Lords. The consequence was that, in 1843, Dr. Chalmers with 420 other ministers left the hall of the Assembly, and constituted themselves the General Assembly of the Free Church. Most of their congregations followed them, and in four years they had 700 churches. The Free Church maintained the doctrine and discipline of the body from which they had seceded; and the ability of their first Moderator, Dr. Chalmers, soon gained them a secure position in Scotland. His work was carried on by Dr. Candlish. Among the lights of the Free Church were Dr. Guthrie, Mr. Murray Dunlop, and Hugh Miller. In 1863 negotiations for union with the United Presbyterian Church were begun, and ten years later a working agreement was arrived at by which a "mutual eligibility" of ministers from all the negotiating churches was declared. In 1874 the Cameronians were united to the Free Church. A majority of the latter have declared in favour of disestablishment.

Freehold is literally "the holding of a freeman," and the estate of a freeman was originally for his own life only; but from a very early period freehold estates of larger quantity existed (*i.e.* estates of inheritance either in fee simple or fee-tail). Still, the original quality of the freehold is discernible in the following well-known and accurate definition: "An estate of freehold is any estate of uncertain duration, which may possibly last for the life of the tenant (*i.e.* the possessor) at least." [ESTATE, FEUDAL SYSTEM.]

Free Imperial Cities (*Freie Reichsstädte*), German towns which were immediately under the Emperor, which exercised free jurisdiction within their territories, and which had an independent position in the Diet or Assembly of the Empire. Their privileges were acquired either by special grant, by purchase, or by force of arms. Their numbers fluctuated considerably, as they were liable to lose their position in the same way as they had gained it. For some time they were judicially under imperial officers, a *Reichsvogt*, or imperial criminal judge, and a *Reichsschultheiss*, or imperial civil procurator. These officers they subsequently elected themselves; and the authority of the Emperor, except on special occasions, became merely nominal. At the Diet of Augsburg (1454) the Free Cities were divided into two benches, the Rhenish and the Suabian; and at the peace of Westphalia (1648) they were formed into the third collegium of the Imperial Diet. At the time of the French Revolution they numbered fifty-one, Cologne, Aix-la-Chapelle, Frankfort-on-the-Main, Hamburg, Bremen, and Worms, being the chief among the Rhenish cities; and Ratisbon, Nuremberg, Augsburg, and Ulm, among the Suabian. On the dissolution of the Empire in 1806, Augsburg and Nuremberg went to Bavaria, and Frankfort became the capital of the Confederation of the Rhine. The latter regained her freedom in 1815, but lost it in 1866, since which time Hamburg, Lubeck, and Bremen have been the only Free Imperial Cities. These last have now, by joining the Imperial Customs' Union (Zollverein), surrendered the title so far as financial matters are concerned.

Free-Lances or FREE COMPANIES were bodies of knights and men-at-arms who roved about Europe in the Middle Ages offering their services to the highest bidder. Among the more famous of these bands were the Austrian *Landsknechte*, who were originally raised in 1487, and continued to play a leading part in all the wars of the next two centuries; the Swiss mercenaries, who were found in every country and service; and the *Condottieri* of Italy.

Freeman is one who at birth inherits the rights and privileges of a citizen, as distinguished from a *freedman*, who is born a slave and has acquired freedom. In the United States the latter term was applied to the emancipated negroes. In corporations, a freeman is a person who has inherited or acquired by adoption, purchase or apprenticeship, the rights of a citizen. By the Municipal Reform Act (1835), persons who had hitherto enjoyed the right of voting were placed on the Freeman's Roll, while those who obtained privileges by virtue of the Act were placed on a separate list called the Burgess Roll.

Freeman, EDWARD AUGUSTUS (1823-92), an English historian, was born at Harborne, Staffordshire, and was elected scholar of Trinity College, Oxford, in 1841, becoming fellow in 1845. After having several times been an examiner, he was appointed Regius Professor of Modern History in the University in 1884 in succession to Dr. Stubbs. In 1868 he had been an unsuccessful Liberal candidate for Mid-Somerset, and was in after-years a firm Home Ruler. He early inherited an estate in Somersetshire, and was able to devote himself without interruption to

his favourite studies. His name will be remembered chiefly in connection with his *History of the Norman Conquest* (1867–76), and his doctrine of the *Unity of History* first propounded in the Rede lecture at Cambridge in 1872. Among his numerous other works were *The History and Conquest of the Saracens*, *The Reign of William Rufus*, and his *Old English History;* and he was at work upon a *History of Sicily* when he died of small-pox at Alicante. He was a high authority on the history of architecture, and was for many years a regular contributor to the *Saturday Review*, but resigned in consequence of the line taken by that paper on the Eastern Question in 1877. He took a prominent part in the agitation of that time against English support of Turkey against Russia. He was Hon. D.C.L. of Oxford, LL.D. of Cambridge and Edinburgh, and a knight of several foreign orders.

Freemasons were originally what their name, *Freemen Masons*, implies—namely, members enjoying all the privileges of the guild of masons. These craftsmen travelled about in order to take part in building, and were recognised and accorded hospitality after exchanging certain signs, which were known only to members of the guild. A master was at the head of the central organisation, and wardens presided over branches of it. In Germany the masons were not only builders, but also, to a large extent, architects. Modern, or as it is sometimes called "Speculative," Freemasonry has no connection with any particular trade, though the Scotch Lodges trace their origin to the masons who came from abroad to build the Abbeys of Melrose, Kilwinning, and Holyrood in the 12th century, and those of England to an assemblage of masons held by Æthelstan at York in 926. In reality they are of English origin, and date from the 18th century only. In England the two Grand Lodges were those of York and London, who disputed about precedence and other matters till, in 1813, they were united by the Dukes of Kent and Sussex, their respective Grand Masters. There is now one central governing body, called the "United Grand Lodge of Ancient Free and Accepted Masons of England." The Prince of Wales is its Grand Master; and besides his deputy, its officers include Grand Wardens, provincial Grand Masters, Masters and Wardens of Lodges, and annually-elected stewards. There is every year a masonic festival, and the stewards meet four times during the same period for business purposes. The object of existing English freemasonry is "the practice of moral and social virtue," and, above all, mutual relief. A freemason becomes first an "apprentice," next a "fellow-craft," and, lastly, is admitted as "master-mason." A set of pass-words and a peculiar way of shaking hands enable freemasons to recognise one another. The Grand Lodge of Scotland dates from 1736, and has now more than 600 branches. That of Ireland, founded in 1730, has 900 lodges under it. Freemasonry has been introduced into India, China, and the Colonies, and in the United States flourishes greatly, having nearly 10,000 lodges. On the Continent it has been used as a political agent, and has been condemned by five Popes as subversive both of religious and civil authority. It exists, nevertheless, in every country of Europe. In England it has never been regarded as revolutionary, and when in 1799 the Act for the suppression of secret and unlawful societies was passed, freemasons' lodges were expressly excepted from its operation. Encyclopædias of freemasonry have been published both in German and English, as well as many other works on the subject.

Free Path, in molecular *Physics*. The kinetic theory of gases regards each molecule of gas as being endowed with a definite speed, and as rushing about in an irregular course dependent on the number of collisions it has with other similar molecules. It travels in straight lines, which alter their direction when oblique impact occurs. If the mass of gas be at a definite temperature, the speeds of the constituent molecules will all approximate closely to a definite average; and though each is behaving differently, the length of straight-line path between successive collisions will also approximate to a definite average length. In dealing with the mass of gas as a whole the value of these averages is required, rather than the individual values for a given molecule. They are called respectively the *velocity of mean square*, and the *mean free path*, for the given gas.

Free Port is a port at which all vessels may load or unload without being subject to any customs or other duties, except harbour dues. They were established in the Middle Ages by France, Spain, Austria, Portugal, and the Italian States, and in the 18th century, when protective tariffs had become frequent, were of particular importance. The system of bonding soon, however, took their place, and few Free Ports survived long in the 19th century. Trieste and Fiume on the Austrian shores of the Adriatic, and Hamburg and Bremen on the Baltic, were free ports till quite recently. Hongkong, Singapore, Amboyna, St. Thomas, and a few other places are still centres of this kind, their chief use being as entrepôts where commodities destined for distant markets may be more easily exchanged.

Free Trade, in the largest meaning of the phrase, consists in the liberty of individuals to buy and sell commodities of all kinds in such markets and at such prices as they think advantageous for themselves. Owing to historical circumstances, the expression has become limited to international commerce, and can be applied to the domestic trade of a country only in the qualified form "internal free trade." As attempts on the part of Governments to regulate foreign commerce now usually take the form of indirect encouragement or discouragement of exportation and importation respectively, Free Trade is best defined under its negative aspect as the "absence of artificial restraints on international exchange." When customs duties do not have this effect, but merely furnish a source of revenue, they do not interfere appreciably with freedom of trade.

The economic advantages of universal Free Trade

are now generally recognised by economists; but within the last hundred years men's minds were still dominated by a very different set of ideas. England, the country destined to emancipate commerce, was herself under the sway of the Mercantile System, and strove to obtain the exclusive advantages which foreign trade, when judiciously managed, was supposed to bring. Chief among these was a plentiful supply of the precious metals, for the command over all kinds of wealth exercised by money as the medium of exchange, and the fact that the value of wealth is measured in money, had led to the notion that money is identical with wealth, or, at any rate, is the most desirable form that wealth can take. Stress was laid on the importance of a large stock of specie on which the sovereign could draw for his foreign wars and other extraordinary expenses. The main aim of the Government, therefore, was to secure a "favourable balance of trade"—*i.e.* an excess of exports over imports—and for this purpose exportation was encouraged by bounties and drawbacks, while differential duties were placed on goods imported from foreign lands. The same policy was pursued in the negotiation of commercial treaties and the treatment of colonial dependencies. [MERCANTILE SYSTEM.] The Mercantile Theory gradually fell into disrepute, partly owing to the practical experience of merchants, but mainly through a closer study of economic questions. Adam Smith's *Wealth of Nations* (1776) was the first work that displayed a firm grasp of the subject in all its bearings. His advocacy of Free Trade is based on three main arguments. In the first place, he struck at the root of the Mercantile System by showing that not only does money not constitute wealth, but little gold and silver change hands in the course of international commerce. Imports are paid for by exports, through the medium of bills of exchange. In like manner, when it is desired to transfer wealth from one country to another, it will naturally take the form of commodities rather than that of bullion. During the war with France a merchant who undertook to supply money abroad for the payment of the English troops would do so by drawing a bill on a foreign correspondent and exporting goods to the amount, the only way in which he could benefit himself by the transaction. Thus the troops were paid out of the "money of the mercantile republic," which circulated more about the seat of war; for money obeys the same law as other commodities, and flows to those places where it is most in demand. In the second place, Adam Smith dwells on the beneficial effects which result from applying the principle of Division of Labour to international commerce. Just as the specialisation of industry in a single community, by economising time and skill, leads to the production of more wealth, so the sum total of wealth in the civilised world would be increased if the people of each country always followed those trades in which the natural products of the soil and their own acquired capacity give them the greatest advantages. By freely exchanging the surplus of their respective products, all countries would derive equal benefit from the new wealth thus created. But trade will never flow into the channels necessary to effect such a result while a false direction is given to it by the interference of the State. Self-interest appeared to Smith to be the true source of economic progress, for he believed that the individual, in seeking his own advantage, unconsciously promotes the welfare of the community to which he belongs. The direction of commerce should therefore be left to private traders, since each is a better judge than the State can be of the course most adapted to further his own interests. We are thus led from Smith's great positive argument to his negative argument, in which he maintains that the State never has, as a matter of fact, succeeded in procuring for a nation those advantages which it professed to have in view. Subsequent writers have done little more than amplify these two arguments, which must be regarded as economically true, even by those who deny the salutary effects of "natural liberty" in the sphere of morals or politics.

Adam Smith's work made a deep impression on thoughtful politicians, and in Pitt he found a disciple who was anxious to remodel the fiscal policy of the nation in accordance with his views; but Pitt's plans of reform were cut short by the outbreak of the French war, which gave full scope to the growth of vested interests and left behind it a strong feeling against any proposals that savoured of Free Trade. This feeling was not shared by the manufacturers and traders. In 1820 petitions for Free Trade were presented to Parliament by the London merchants and the Edinburgh Chamber of Commerce, and the report of the Committee appointed to examine them commented favourably on the views which they contained. The way was thus paved for the first instalment of reform, which was carried out by Huskisson as President of the Board of Trade (1824–27). His measures included a reduction of the duties on raw silk and wool, and the establishment of Free Trade between Great Britain and Ireland. The work of reform was resumed by Peel in 1842. There were then 1,150 items on the tariff, but 10 articles produced £20,871,136 out of a total revenue of £22,962,610. Besides lowering prohibitive duties so as to make them productive of revenue, Peel aimed at reducing those on raw materials to a nominal amount, and subjecting manufactured articles to duties averaging 20 per cent., which would not exclude foreign competition. In 1845 the duties on silk, cotton, and other raw materials were abolished, and the differential duties on sugar were considerably reduced. Peel displayed his usual caution in attempting a gradual reform of the tariff, chiefly in those directions where it would arouse the least opposition; but subsequent events showed that he overestimated the strength of the great protected interests, and the credit of establishing Free Trade has fallen to Cobden and others, who had the courage to adopt a bolder course. [CORN LAWS.] After the repeal of the Corn Laws (1846), which involved the surrender of the landed interest at home, the colonial and shipping interests could not long hold their ground. The duties on foreign and colonial sugar and timber were gradually equalised, and converted into revenue duties, and the attempt to keep the

carrying trade to England in the hands of British subjects was abandoned. [NAVIGATION LAWS.] The reform of the customs was completed by Mr. Gladstone in 1852-53 and 1860, when the protection of manufactures entirely ceased, and all differential duties and nearly all those on foodstuffs were abolished. Our commercial treaty with France in the same year gave a great stimulus to Free Trade on the Continent, where it had hitherto been confined to small States, such as Sardinia, Holland, and Belgium. The example set by France was soon followed by the Zollverein or Customs Union of the German States, and in the course of a few years treaties were concluded between all the chief European countries. They generally contained a provision, known as the "most favoured nation clause," stipulating that any commercial privileges granted by one of the negotiating parties to a third Power should be extended to the other party. This promoted Free Trade by creating a "conventional" tariff, as opposed to the ordinary tariff, which, owing to the number of treaties, would seldom need to be applied.

It seemed as though the hopes of Cobden would speedily be realised, but during the last twenty years a reaction has taken place on the Continent, while the policy of the United States for the thirty years preceding the Presidential Election of 1892 has been increasingly and even fanatically Protectionist, and a strong leaning towards Protection has manifested itself in our own colonies. The reactionary movement on the Continent has been due, among other causes, to the growth of a stronger feeling of nationality, and the panic occasioned by the decline of agriculture, and the increasing stress of the competition between the manufactures of different nations. In so far as these are symptoms of a period of transition both in the economic and the political sphere, they may be regarded as disturbing influences of a temporary character, and a return to Free Trade may be looked for as soon as the political and economic stability which favour its progress have been restored. American Protection is to be ascribed in great measure to commercial ambition and the feeling of hostility to England, which originated in our attempts to check their industrial development, and led to the War of Separation. Protection naturally suggests itself to young countries, like our self-governing Australian colonies, as an easy method of hastening on their political and social development. It may sometimes have this effect, although the evidence so far does not tend to support the theory. The "political" arguments in favour of Protection carry great weight in America as well as in Australia, but, as they have only an indirect bearing on the general question of Free Trade, they cannot be discussed here. [PROTECTION.]

But those who support a restrictive policy for political reasons attempt at the same time to justify their action on economic grounds. They assert that "Protection gives employment," but employment requires capital, and the immediate effect of protection is merely to withdraw capital and labour from some undertaking in which they were profitably employed, in order to embark them in another to which they were not previously attracted, because there was less prospect of success. It is indeed conceivable that the establishment of new enterprises under Government sanction might increase capital by encouraging saving, but experience shows that its growth has always been greater under a system of Free Trade. Capital is then rapidly diverted from a declining industry to the production of other goods for foreign markets, and the increased returns stimulate fresh accumulation; whereas Protection, by creating vested interests, tends to prolong its unproductive employment. Without examining the "Infant Industry" and "Variety of Industry" arguments on their political side, it may be well to point out some economic fallacies of a grosser kind involved in the assumption that a Government can benefit the community by giving an artificial direction to the investment of capital. The nominal earnings of those engaged in the favoured industries will at first be exceptionally high, while the real wages and profits of all other producers will be diminished, for they will receive a less amount of the protected commodities in exchange for their own products. They will exclaim that their treatment is unfair, and the Government will be obliged to resort to universal Protection, so that the values of all goods will return to their original balance. If it refrains from this course, and the protected industry, in spite of natural drawbacks, makes some progress, the high prices at first realised will soon be cut down by competition. A point will at last be reached at which it may fairly be contended that the duty should be withdrawn, but those who are benefited by it will not readily consent to its removal. Combinations of manufacturers and mine-owners to keep up duties exercise a disastrous influence on trade in the United States, and, it may be added, are also a powerful source of political corruption.

A more serious objection to Free Trade is brought forward by those who assert that, where the movements of capital are unfettered, it will tend to emigrate from old countries to lands where it can obtain a higher rate of interest; that labour, though more slowly, will follow the same course, and that thus the prosperity of a nation may be undermined. Adam Smith thought that everyone would, in his own interest, always prefer to employ his capital at home, but the danger and delay attending foreign investments have greatly decreased since he wrote. However, national feeling will probably always be strong enough to supply a country with as much capital as it really requires.

England has reaped so much benefit from Free Trade that she is not likely ever to return to deliberate and systematic Protection. But there is a class of politicians, who, while they would not go so far, maintain that, since foreign countries persist in protecting their industries, England must do so also in self-defence. The "Fair Trade" argument is based on the old fallacy that the seller derives more advantage from trade than the buyer. We should gain nothing by reducing our imports; these must always be paid for in exports, though the latter may fall short of the amount we desire.

The case against "fair trade," or "reciprocity," was graphically summed up by John Bright in his question, "whether two wrongs make a right?" Others recommend "retaliation" rather than "reciprocity;" they would tax imports, not because they think them injurious, but because they believe that by excluding the goods of foreign countries from our markets we should induce them to admit our own. It is far more likely that foreign nations would triumph over our conversion to their principles than that they would be inclined to adopt a policy which we had ourselves abandoned.

Most Free Traders, while denying the necessity for reciprocity or retaliation, would allow that under certain circumstances it may be advisable to set aside their principles for a time. If, for example, it can be shown that the threatened exhaustion of our supplies of coal and iron, on which our commercial supremacy depends, can be averted by checking their exportation, a case is clearly made out for Government interference. Still more is this so where the issue at stake is the moral or intellectual welfare of the community. Political economy is concerned only with the material aspects of life, and must give way when it comes into collision with matters of higher import.

Free Will. [WILL.]

Freezing means the solidification of a liquid. It is generally applied to water only, but is applicable to all other such cases. Freezing of water occurs at a temperature so nearly constant that it is regarded as one of the fixed points required for the graduation of thermometers. On the Centigrade scale it is marked 0°, and on the Fahrenheit scale 32°. It is found to vary slightly with changes of pressure, an increase in pressure lowering the freezing-point. One atmosphere increase lowers it by about ·0075° C. This variation is far slighter than that of the boiling-point per atmosphere increase or decrease. Liquids, as a rule, contract on freezing; water is a rare exception, expanding as it does to the extent of one-eighth its liquid volume. It is on this account that increase of pressure lowers the freezing-point of water; such increase usually raises the freezing-point of other liquids, and renders the process of solidification possible at higher temperatures than before pressure is applied. Thus to effect solidification the temperature may be lowered, or pressure may be applied. Both means are adopted when the liquid is very difficult to freeze. Another resource is available when the liquid has to be kept under pressure to prevent vaporisation. The pressure is suddenly removed, vaporisation immediately begins, and, requiring heat for this change of state, it takes it from the bulk of liquid. Enough may be thus abstracted to effect the freezing of the remaining liquid. Salt water freezes at a lower temperature than pure water, the exact point depending on the quantity of salt present. At this point the water solidifies as almost pure ice, leaving the salt behind. Saturated brine behaves differently, freezing of part causing the remaining liquid to lose some of its salt. This fact of the lowering the freezing-point of water by addition of salt is utilised in the formation of *freezing-mixtures* (q.v.). [COLD.]

Freezing Mixtures are mixtures of various substances employed for the production of low temperatures. Most depend upon the fact that when a solid liquefies, energy is in general absorbed, and hence the temperature falls. Thus, when potassium sulphocyanide is dissolved in cold water to form a concentrated solution, the temperature falls to −20° C. If ice, or snow, and salt be mixed together, a strong solution of brine is obtained, and the temperature sinks to −23° C. To obtain the greatest lowering, the proportions of ice and salt, by weight, should be about 3 to 1. If calcium chloride crystals be mixed with an equal weight of snow, the temperature falls to −45°, a point at which mercury solidifies. Also for the production of low temperatures, advantage is frequently taken of the fact that, if a liquid evaporates, energy is absorbed and heat disappears. If, therefore, the evaporation be rapid, the temperature will fall. In this way liquid CO_2 may be converted into a snow-like solid, which, when mixed with ether, forms a very powerful freezing mixture. By the rapid evaporation, also, of methyl chloride (a liquid boiling at −22° C.), extreme cold may be produced, and if a current of air cooled by this means be passed through liquid ethylene, the latter evaporates, and such intense cold is obtained as to cause the liquefaction of oxygen and ordinary air.

Fregilupus, an aberrant genus of Starlings, with a single species (*F. varius*). It formerly inhabited Réunion, but became extinct in the first half of the 19th century. There is a good specimen in the Natural History Museum, South Kensington.

Freiberg. A town in Saxony, midway between Dresden and Chemnitz, 20 miles W.S.W. of the former. Founded in 1175, the city has a cathedral, in which are tombs of the Albertine Electors of Saxony. Its mines, discovered in the 12th century, give employment to 6,800 men, and from them silver, bismuth, and other minerals are extracted. The school of mines, founded in 1765, is the first in Europe.

Freiburg, or FRIBOURG, a canton in Switzerland, situated between Berne and Vaud, while small parts of it lie inside the latter, the largest of these looking on the Lake Neufchâtel. The total area of the canton is 644 square miles, and the population is chiefly Catholic. French is spoken by about three-fourths, German by the remainder. Its surface is generally hilly, and in the south there are several peaks of upwards of 6,500 feet. The river Saane runs through the centre from south to north. On it stands Fribourg, the capital, where there is a very fine organ. Gruyère, where the cheese is made, is in this canton. At Morat, in the north, on the lake of that name, a small body of Swiss defeated Charles the Bold of Burgundy in 1476. Fribourg sends six members to the Federal Assembly.

Freiburg-in-Breisgau, a town in Baden, 32 miles N.N.E. of Basel. Its cathedral, begun in

1122 and finished in 1513, is a fine specimen of Gothic. It is built of red sandstone, and has an elegant steeple, 381 feet high. The university, founded in 1455, has more than 800 students and 80 professors, and a fine library. Among its manufactures are sewing silk, buttons, and paper. Freiburg suffered much in the Thirty Years' War, and has twice belonged to France. Here the Baden revolutionists of 1848 were defeated by the German Confederation.

Freight is, etymologically, "that with which a ship is *fraught*," viz. loaded. The term is, however, generally used of the price paid by the owner of a cargo for its carriage by the ship-owner. The terms of the agreement are stated in the Charter-party or Bill of Lading. Freight is usually not paid until the delivery of goods; but if it has been advanced, it is not recoverable, even though the cargo may have been lost or captured. Till the Merchant Shipping Act of 1854 it was held that the wages of the crew depended upon the freight being earned; and in America this is still the rule, though with important modifications.

Freiligrath, FERDINAND (1810–76), a German revolutionary poet, was born at Detmold, the son of a schoolmaster. He was almost entirely self-educated, being engaged in commerce from a very early age. In 1835 he suddenly gained a name by some poems contributed to Chamisso's *Musen-almanach*. Three years later his first volume appeared. In 1840 he married Ida Melos, who had inspired some of his best lyrics. Having by his *Confession of Faith* (a poem) offended the authorities, he went first to Belgium, and in 1846 to London, returning to Germany after the Revolution of 1848. *Die Todten als Lebenden* (*The Dead as Living*) caused him to be impeached, but he was acquitted. In 1851, however, he came back to London, and did not see the Fatherland again till 1868. While living at Hackney he gave his leisure to poetry, and translated Burns, Moore, and De Musset. In 1867, when he was ruined by the failure of the bank in which he was employed, his countrymen subscribed 60,000 thalers for his relief. Freiligrath was one of the most popular poets of the century. His earliest *Gedichte* have reached a forty-third edition, and his collected works a fifth. During the war of 1870 he wrote some stirring battle-songs.

Freischütz ("Free-shot"), the name of the marksman in a German legend, who makes a compact with the devil by which the latter gives him seven shots, all of which are sure to hit the mark but the seventh, the direction of which he reserves to himself. In the northern version it is a fowler who sells his soul in order that for seven years he may be certain of his aim. The libretto of Weber's opera, *Der Freischütz*, is founded on this legend.

Frelinghuysen, FREDERICK (1753–1804), an American statesman of Dutch extraction, took part in the battles of Trenton and Monmouth Court-house, was a member of the Continental Congress in 1778 and 1782–83, and afterwards became a United States Senator. THEODORE, his second son (1787–1861), was known as the "Christian Statesman" for his speeches in the American Senate. His nephew, FREDERICK THEODORE (1817–85), was Attorney-General of New Jersey between 1860 and 1870, and in the United States Senate carried a bill against polygamy. He was Secretary of State under President Arthur (1881–85).

Frémont, JOHN CHARLES (1813–90), an American explorer, born at Savannah, his father being a Frenchman. He became a civil engineer, and in 1842 explored the South Pass of the Rocky Mountains, and ascended the highest peak of the Wind River Mountains, which now bears his name. His report showed that an overland route from one side of North America to the other was practicable. In 1843 he explored the Great Salt Lake, and penetrated as far as Fort Vancouver. During the Mexican War he did good service, but was sentenced by court-martial to be dismissed the service for refusing to obey his superior officers. In 1848 he started on an expedition to the Rio Grande, but the guide lost his way, and only two-thirds of the party returned to Santa Fé (New Mexico) after terrible sufferings, which had caused a resort to cannibalism. Next year, however, Frémont reached California, where he became a senator of the newly-organised State. He conducted another expedition to the Rio Grande in 1853. In 1856 he was the unsuccessful Republican candidate for the Presidency, but in 1864 withdrew in favour of Lincoln. He was governor of Arizona in 1878–82. A scheme which he propounded for a South Pacific Railway caused him to be condemned for fraud by the French Government in 1873, but he did not appear at the trial. He published *Memoirs of My Life* in 1886.

French Bean, KIDNEY or HARICOT BEAN (*Phaseolus vulgaris*), a species of a genus of about fifty leguminous plants, mostly natives of tropical America, distinguished by the long spirally-twisted points of keel-petals of their flowers. *P. vulgaris* is distinguished by having only a few flowers on a stalk with ovate bracts below each of them. The whole plant is slightly pubescent; its leaves consist of three oval acute leaflets with angular petiolules swollen at their bases, and small stipules; the flowers are white, rose-coloured, or lilac; and the pod is pendulous, compressed, pointed, and from 3 to 6 inches long. It may be a native of Mexico, and is not certainly known to have been cultivated in Europe before the 16th century. In England the unripe pods are eaten; but in Catholic countries the ripe seeds are largely used as a Lenten diet, under the name of *haricots*. If not over-boiled, these seeds have valuable digestive and mildly aperient properties.

French Chalk is a variety of *steatite*, a hydrated silicate of magnesium, of varying composition. It is used for cleaning leather, silk, etc., for marking cloth, and owing to its smooth, soapy feel is also frequently used as a powder for the interior of gloves, boots, etc.

French Literature. The French language is of the Aryan stock of languages, through the

Latin, being one of the Neo-Latin or Romance tongues, which comprise the Portuguese, Spanish, French, Provençal, Italian, Romanisch or Ladin, and Roumanian. The ancient Gauls, however, were Celts. and it was only after many centuries that the all-conquering Romans were able to overpower the Celtic dialects by the *lingua romana rustica.* During the fifth century the Teutonic element was blended with the Gallo-Roman speech, and it left considerable traces of its presence in the popular vocabulary. The *lingua romana* as spoken by the masses was a rude, uncouth form of speech, but when written by the educated and ruling classes it retained much of the Ciceronian and literary spirit.

By the eighth century there was a clear line of demarcation as regards language between Southern and Northern France. The South was known as the country of the *langue d'oc*, or Provençal. The literature in this language was the earliest to flourish, but after a brief period of splendour it as quickly passed into a stage of decadence. The Southern troubadours of the eleventh and twelfth centuries were the poets of civilised society. They wrote *chansons*, or amatory poems; *complaintes*, or elegiac compositions; *tensons*, or *jeux-partis*, poetical discussions or debates on questions of love or war; *sirventes*, or satirical compositions; *pastorelles*, or eclogues, introducing two or more characters; and *ballades.* Several romances of chivalry were also written in the *langue d'oc*, and among other monuments of Provençal literature were a translation of Boëthius's *De Consolatione* and a metrical chronicle of the Crusade against the Albigenses (1210). The first of the troubadours of whom we have authoritative knowledge was Guillem IX., Count of Poitiers; his successors are far too numerous to particularise. Out of some 400 troubadours there were only about twelve women singers. They were much inferior in merit to the male troubadours, though the most famous of them, the Countess Beatrix de Dia, has been styled the "Sappho of Provence." The Albigensian persecution of the thirteenth century practically destroyed Provençal poetry, as the lands of the nobles were laid waste, and Innocent IV. condemned the language as heretical and forbade its use by the clergy. The troubadour traditions feebly lingered, and in the first half of the fourteenth century an effort was made to revive the old poetry by the formation of a society of song at Toulouse. Branch societies were formed in other places; but, in spite of poetic contests, they failed to revive the former brilliant spirit.

The language of the North, or *langue d'oïl*, was longer in attaining maturity, but it became more permanent. The poets of the *langue d'oïl* were known as trouvères. They were animated by a more earnest spirit than the troubadours; and just as it is claimed for the latter that they were the precursors and inspirers of Dante, Petrarch, and Boccaccio, so it is claimed for the trouvères that by their *chansons de geste* they inspired Ariosto, Tasso, and Chaucer, and, at a later period, Milton, Goethe, and Hugo. History, adventure, mythology, and Biblical narratives were the inspiration of the trouvères; and they produced romances of chivalry, rhymed chronicles and chronicles in prose, fabliaux, apologies, lais, virelais, rondeaux, ballades, etc. The first celebrated French romance was the *Chanson de Roland*, an epic composed by a Norman trouvère in the eleventh century. Then there were the romances of the Round Table. There were also writers of mysteries, miracle plays, and moralities. The principal chronicles of the first part of the Middle Ages were the *Roman de Rou* and the *Roman de Brut* of Robert Wace; *La Conquête de Constantinople* by Villehardouin; the *Histoire de Saint Louis* by the Sire de Joinville; and the *Chronicles* of Froissart. Guillaume de Lorris began the *Roman de la Rose*, which was continued by Jehan de Meung. The *Roman du Renard* was at once the most comprehensive and representative of the semi-epic, semi-satirical compositions belonging to the thirteenth and fourteenth centuries. It had a direct bearing upon the social condition of the people, and its salient features are common to almost all languages. Adam de la Halle and Thibaut, Count of Champagne, were the principal song-writers. Rutebeuf was a clever but unwholesome writer of fabliaux, and Marie de France was justly esteemed for her lais and fables. Charles d'Orléans (1391–1465) is regarded as the last of the trouvères.

Chronicle-writing was abundant in the thirteenth and fourteenth centuries, though it only attained a high pitch in Froissart (d. 1410), referred to above, whose record of the hundred years' struggle between France and England has rarely been excelled for picturesqueness. Cuvelier acquired some reputation, though chiefly for his choice of subject, which was the romantic hero of Brittany, Bertrand du Guesclin. Monstrelet, who came some time later, was a trustworthy, though a not very artistic, chronicler. The *Roman de la Rose*, already alluded to, was a representative allegorical work, dealing with the joys and sorrows of lovers. It was during the fifteenth century that the transition from Old French into Modern French was accomplished. Philippe de Comines (1445–1509) combined the politician and the moralist with the historian. He was original and yet simple in style, and manifested an impartial judgment. Of lighter writers, mention must be made of Eustace Deschamps, who wrote patriotic ballads; Olivier Basselin, who called his bacchanalian compositions *Vaux-de-Vire*, from which came "vaudeville;" and François Villon (1431), a poet of irregular life, whose effusions have for generations received the hall-mark of critics. His *Grand Testament*, which is regarded as his masterpiece, is strong in humour and pathos. Out of the fabliaux developed the novelettes, the chief being the *Cent Nouvelles Nouvelles;* while a successful painter of contemporary manners was found in Antoine de la Sale (1398–1462), author of *Petit Jehan de Saintré* and *Les Quinze Joies du Mariage.* The first of sacred writers at this period was Jean Charlier de Gerson (1363–1429), Chancellor of the University of Paris, who wrote powerfully on behalf of religion and the Church. Another moral regenerator was the poet Alain Chartier (1386–1449) (q.v.). His principal title to fame is *Le Quadriloge*

Invectif. Chartier was pure and noble in character, with a firm faith in the future of his country. The miracle play originated at this time, and the brotherhood of the *Confrères de la Passion* obtained official authorisation. Farces were performed by the law students, *Les Clercs de la Basoche* (q.v.), and soties by the *Enfants Sans Souci*. The latter, who attacked all persons and institutions falling under their displeasure, were suppressed by Francis I. The mysteries, after a chequered career, were prohibited by the Parliament of Paris in 1548.

The Reformation and the Renaissance of the sixteenth century had an important effect upon French literature. The first development was a religious revolution, directed against the abuses of the Papal system. John Calvin (1509–64) was the great leader of the reformers, and the earliest theological and literary result of the new movement was his *Institution de la Religion Chrétienne*. This luminous and vigorous work caused its author to be accepted as one of the fathers of French literature. Speaking generally, the Reformers were for a time "the leaders in philological science, in erudition, and in the industrial arts," though men like L'Hôpital and Estienne Pasquier are also worthy of mention. Coadjutors and contemporary reformers with Calvin demand some attention. Pierre Viret (1511–71), though born in Switzerland, laboured as a preacher in France with great success. His sermons were listened to by enthusiastic crowds in Paris, Lyons, and elsewhere. Théodore de Bèze (1519–1605) was a powerful supporter of Calvin. He was a learned polemic, and produced commentaries on the New Testament, a translation of the Bible, sermons, a metrical version of the Psalms, and a history of the Reformed Churches in France. Robert Estienne (1503–59), a member of a celebrated family of printers, produced eleven editions of the whole Bible, and twelve of the New Testament in Hebrew, Greek, Latin, and French, also a concordance of the Bible, and other works. His son, Henry, a distinguished grammarian and philologist, wrote an *Apologie pour Hérodote*, etc. François de la Noue (1549–91) wrote earnestly against impiety, injustice, and immorality; Duplessis-Mornay (1549–1623) published, among other treatises, the *Institution de l'Eucharistie*, which roused the whole clergy of France and Italy; Agrippa D'Aubigné (1550–1630), in addition to his *Histoire Universelle*, wrote *Les Magiques*, the *Confession de Sancy*, and other works which served the cause of truth by their remarkable wit, vigour, and imagination; and Clément Marot (d. 1544) exalted French verse by his effective translation of the Psalms, and his graceful epistles and elegies. On the Catholic side the men of letters were not so eminent as these, but among writers worthy of citation are Blaise de Montluc, Pierre Charron, Jacques Davy du Perron, St. François de Sales, and Pierre de Bérulle. But the most persistent opponents of the Calvinists were the priests of the Sorbonne, who were strongly ultramontane in their doctrines and methods. The philosophical revolution against the traditions of scholasticism was the second development of the Renaissance. It had several celebrated exponents. François Rabelais (1483–1553), in his allegorical creations *Gargantua* and *Pantagruel*, attacked the lay powers with caustic dexterity, but absolutely scourged the monkish institutions with his biting wit and sarcasm. Bonaventure Despériers (d. 1544) wrote satirical fables with much of the spirit of Rabelais. Michael de Montaigne (1533–92), the illustrious author of the *Essais*, was one of the most original writers and independent thinkers of the age. An honest doubter, he was condemned for his scepticism by the Fathers of Port Royal. Estienne Dolet (1509–46), who published for Marot and Rabelais and other friends, and himself wrote Latin works in prose and verse, was executed for his free-thinking views; and Ramus (1515–72), a scientific and philosophic investigator, was slain in the general massacre of the Huguenots. The third development of the Renaissance was the literary revolt against the grammar and the art of the Middle Ages. Pierre Ronsard (1524–89), with his *Pléïade*, was at the head of this movement, and among other writers were Joachim du Bellay, Estienne Jodelle, Pierre de Larivey, Du Bartas, and Philippe Desportes. The only author who resisted the movement was Mathurin Régnier. The civil and religious dissensions of the age gave rise to a number of publicists, writers of memoirs, etc., including Bourdeilles, Sieur de Brantôme, Jean Bodin, Francis Hotman, Nicholas Rapin, Pierre Pithou, etc. History was ably represented in De Thou; and Jacques Amyot, Bishop of Auxerre, produced a notable translation of Plutarch's *Lives*.

The seventeenth century saw the French monarchy consolidated and the national unity secured. Literature likewise attained a high degree of splendour, and masterpieces were produced in various fields of intellectual effort. An impetus was given to learning and the arts by Richelieu, who founded, in 1635, the Académie Française. He also founded the Imprimerie Royale, protected the Collége de France, and encouraged the study of the vernacular in the grammar-schools. The eminent court poet, Malherbe (1556–1621), reintroduced order and discipline in imaginative literature, though it must be admitted that much of the credit was due to his predecessors, Ronsard, Du Bellay, Desportes, and others. The ablest followers of Malherbe were the Marquis de Racan (1589–1670), author of *Les Bergeries*, a pastoral poem cast into a dramatic form, and the Président Maynard, author of *Poésies*. The spirit of sociality played a conspicuous part at this period in the regeneration of literature. The conclave of the Hôtel de Rambouillet rendered excellent service in the outset; but its influence was doomed to perish through its ultimate exclusiveness and bigotry, and it brought condign punishment on itself in Molière's *Femmes Savantes*. Among the frequenters of the Hôtel were Voiture, whose writings were permeated by the Italian influence, and Guez de Balzac, whose compositions were as strongly permeated by the Spanish influence. Associated with the meetings at Mdlle. de Scudéry's were Conrart, the poet; Chapelain, author of the *Pucelle;* and the writers of heroic romances, Gombauld and La Calprenède. Bohemian literary life had its representatives in Théophile de Viaud,

Saint-Amand, Saint-Pavin, Charles Sorrel, and, last but not least, Scarron, the author of *La Roman Comique*. The stage was vivified by the new life imported into the drama by De Viaud, Alexandre Hardy, Racan, Rotrou, and the "Five Authors," collaborators of Richelieu. Reform in moral and metaphysical philosophy was undertaken by Descartes, whose *Discours de la Méthode* indicated a new departure. The Port Royal des Champs signalised an attempt made by the Roman Catholics to reform their own Church, the moving spirits being the Arnauld family and the Abbé de Saint-Cyran. It was at the Hôtel de Rambouillet that Corneille (1606–1684) read his *Polyeuete*, and Bossuet (1672–1701) gave his first sermon. Among the other poets of the period may be cited the witty Claude de Malleville, Sarrasin, Godeau, and the court dramatist and entertainer, Isaac de Benserade.

The literature of the second half of the seventeenth century was even more brilliant than that of the first. No other age has witnessed such a galaxy of sacred orators as that which produced Bossuet, Bourdaloue, the golden-mouthed Massillon, Fléchier, and the benevolent and liberal-minded Fénelon, author of *Télémaque*. The drama also rose to its greatest height. Corneille produced his last tragedies, attaining almost the height of absolute perfection in his masterpieces *Le Cid*, *Cinna*, *Horace*, and *Polyeuete*. Space forbids us to mention his many other noble dramatic compositions. Corneille "created tragedy, inaugurated comedy, and prepared the opera." Molière (1622–73), confessedly the first comic poet among the moderns, exhibited his humorous creative genius in such masterpieces as *Le Tartufe*, *Le Misanthrope*, and *Les Femmes Savantes*—works distinguished as much for their matter as for their sparkling style. Boileau (1636–1711), author of *L'Art Poétique*, *Le Lutrin*, *Satires*, *Épîtres*, etc., "personifies the taste and literary influence" of the time; Racine (1639–99), author of *Athalie*, *Phèdre*, and other tragedies, manifests the perfection of classical workmanship; while La Fontaine (1621–95), author of the *Contes* and the *Fables*, exhibited a nimble though not always praiseworthy wit in the former, and a graceful wisdom in the latter. In philosophy, in addition to Descartes, the founder of the modern idealist school, there arose Malebranche, an ingenious and elegant writer, whose chief work is *La Recherche de la Vérité;* and Blaise Pascal (1623–62), one of the profoundest thinkers of the age—a man of brilliant genius, whether regarded as a geometrician, philosopher, or man of letters. His *Lettres Provineiales* are perfect. There was a succession of novelists, including D'Urfé, Cyrano de Bergerac, and Furetière. Protestantism had its defenders in Claude, Saurin, Du Bosc, Bayle, and Leclerc; Jansenism in Claude Lancelot, Du Guet, Nicole, Le Maistre de Sacy, and Quesnel; and Free Thought in Saint-Evremont, Bayle, Chapelle, Chaulieu, and Madame Deshoulières. The political writers included Cardinal De Retz and Guy Patin. Conspicuous among the miscellaneous writers for genius and vigour were La Rochefoucauld, author of the *Maximes* and *Mémoires;* La Bruyère, the depicter of contemporary manners; Mézeray, with his *History of France;* Madame de la Mothe-Guyon, the sentimental mystic; the novelist, Madame de la Fayette, whose *Princesse de Clèves* marked a revolution in story-writing; and Madame de Sévigné, author of the famous *Lettres*. Transition writers between this epoch and the next included Le Sage, the author of the immortal *Gil Blas* and other works; Regnard, the writer of comedies; and the Duc de St.-Simon, author of those *Mémoires* which form the most striking condemnation of Louis XIV.

When the eighteenth century opened, France was the leader of social life and literature in Europe. In every branch of letters her writers exhibited far more than the average acumen, virility, and force; and, on the whole, there was a strong moral basis for every intellectual effort. But towards the close of the reign of Louis XIV. absolutism, immorality, and luxury began to bear their legitimate fruit. Criticism and innovation showed themselves in Montesquieu (1689–1755), whose *Lettres Persanes* and *Esprit des Lois* were conceived in a philosophical, satirical, and independent spirit; and also in Fontenelle (1657–1757), who sought to popularise science by his *Pluralité des Mondes*. The later Port Royalists included Rollin, author of the *Aneient History;* Louis Racine, the writer of sacred odes; and D'Aguesseau, who left behind him a graphic picture of the times. The transition poets embrace Jean Baptiste Rousseau, the best lyrical writer of his time; Crébillon, whose tragedies are somewhat turgid, and the dramatists Destouches, Piron, La Motte, and Gresset. The novelists included the Abbé Prévost, author of *Manon Lescaut*; the prolific Marivaux; and Bernardin de St.-Pierre, to whom we owe the charming prose idyll, *Paul and Virginia*.

The great intellectual luminary of the eighteenth century was Voltaire (q.v.) (1694–1778). He summed up within himself the various phases of the revolt against authority. He wrote classical dramas, epic poems, novels, satires, histories, and philosophical and scientific disquisitions. His *Zaïre*, *Henriade*, and *History of Charles XII.*, and the *Age of Louis XIV.*, represent the high watermark of his dramatic, poetic, and historical compositions. So extensive was his influence that during the last years of his life Voltaire became the arbiter of public opinion in Europe. Among Voltaire's critics were Fréron, author of the *Année Littéraire;* Gilbert, the fine lyrical and satirical writer; the poet Gresset, and Palissot, the writer of *Little Letters on Great Philosophers*.

The Encyclopædists were a body of philosophical writers who sought by means of the *Encyclopédie* to collect and classify all human knowledge. The work was suggested by a translation of Chambers's *Cyclopædia*. At the head of the French undertaking were Diderot (1713–84), and D'Alembert (1717–83). They were assisted by Marmontel, Condorcet, Turgot, Malesherbes, and others. The *Encyclopédie* became "the organ of the most advanced and revolutionary opinions of the time, was the object of the most violent persecution by the Conservative party in Church and State, and suffered egregious mutilations at the hands not only of hostile censors, but of timorous printers."

The work was, however, an epitome of the philosophic thought of the time. Buffon, the celebrated naturalist, wrote his treatises at this period; Condillac expanded the philosophy of Locke; and of the moralists, mention must be made of Vauvenargues, Duclos, and Thomas.

Following and completing Voltaire, and yet in certain aspects strongly antipathetic to him, was the celebrated Jean Jacques Rousseau (1712–1778). He sought to regenerate humanity, advancing his educational theories in *Émile*, his political ideas in the *Contrat Social*, and his views of natural morals—which were often opposed to the general conscience of humanity—in his *Nouvelle Héloïse*. There is no doubt that Rousseau's writings precipitated the Revolution. The lighter drama found its exponent in Beaumarchais, and the poetry of nature in Saint-Lambert, Lemierre, and Roucher. Literature was practically suspended by the Revolution of 1789, and oratory took its place. In the stirring pages of Carlyle and other historians we meet with the speeches of men of all parties, including Mirabeau, Mounier, Lameth, Sieyès, Barnave, Vergniaud, Guadet, Gensonné, Cazalès, Robespierre, St.-Just, etc. Revolutionary journalism had its Camille Desmoulins, Loustalot, and Marat; and Royalist journalism its Rivarol, Montlosier, and Mallet du Pan. Newspaper literature wielded immense influence, while extraordinary eloquence swayed the Assembly. Among general writers during the Revolution were Volney, Benjamin-Constant, Necker, and Madame Roland. Dramatic authors included Fabre d'Eglantine, Chamfort, and Collin d'Herbeville. André Chénier, who lost his life on the scaffold, was the finest lyrical and descriptive poet; but the most stirring strains were sung by Rouget de l'Isle, composer of the *Marseillaise*, and Marie Joseph Chénier, who was essentially the poet of the Revolution. The Condillac philosophy was made the basis of all official teaching throughout the republic. A reaction set in against the tenets of the Revolutionists, St.-Martin and Joseph le Maistre writing from the religious side, and Mounier, Morellet, and Necker from the political point of view.

The Consulate and the Empire were not favourable to literature, and, notwithstanding the merits of Delille (1738–1813) and his school, it fell into decay. A new spirit, however, was infused by Chateaubriand (1768–1848), whose brilliant and glowing diction revealed new possibilities in the French language. Passages of his writings have never been excelled in grandeur, and he has been justly regarded as the father of the romantic school. Madame de Staël (1766–1817) opened up the treasures of foreign literature, and enthralled her readers by her romances. After the fall of Napoleon the revival of literature made further progress. Lamennais (1782–1854) was inspired to the discussion of profound religious problems; Lamartine (1790–1869), orator, poet, historian, was deeply Christian in his verse; and Casimir Delavigne, and Béranger (1780–1857), the Burns of France, sang jubilantly through their patriotism. Cuvier and Geoffroy Saint-Hilaire opened up the philosophy of the natural sciences, and Paul Louis Courier the treasures of antiquity. During the reign of Louis Philippe a galaxy of great historians arose. Thiers wrote with patriotic ardour on the Revolution, the Consulate, and the Empire; Guizot, with a less plastic pen, discoursed of modern history; Mignet dealt with the Revolution from the metaphysical aspect; Thierry wrote with picturesque fidelity of past and present movements; Michelet infused the spirit of poetry into his writings; Louis Blanc impressed his historical productions with his own intense personality; and De Tocqueville wrote with philosophic breadth and insight upon the progress of democracy. Among other historians may be mentioned Droz, Henry Martin, and Duruy; while Sainte-Beuve raised criticism into a fine art, and was ably seconded in his treatment of literary history by Scherer and Villemain. These men were greater than the writers whom they immediately succeeded—to wit, Michaud, Daru, Lacretelle, and Sismondi. So in poetry La Harpe, Delille, Fontanes, Duval, Parseval-Grandmaison, Millevoye, Arnault, and Lemercier were to be followed by poets of nobler inspiration. Three ladies—Mesdames Coffin, De Souza, and Krüdener—had already done something to lift the standard of story-writing. The poet Jacquot Jansemin, or Jasmin, began a Provençal revival, and was followed by Romanille, the founder of a society for the preservation of the Provençal language and customs, Mistral, a poet of undoubted genius, and others. Poetic festivals were instituted to aid the movement.

By the middle of the nineteenth century literature had passed through its period of transition, and in some respects had undergone a complete change. Sociology was allied with philosophy in Fourier, St.-Simon, Auguste Comte, and Leroux. Littré and Taine combined the critical with the philosophic spirit in a remarkable degree. Idealism entered into the revival of religious thought, finding its Catholic exemplars in the Abbé de Lamennais, Baron d'Eckstein, Laurentie, Lacordaire, Ozanam, and Maurice de Guérin; while Protestantism had its exemplars in Vinet, Coquerel, and Monod. De Lamennais ultimately abandoned the Church and religion. An independent school of thought was founded for a time by Victor Cousin. The Deists embraced Jules Simon, Garnier, and Jouffroy, and the scientific freethinkers Renan and Havet. There were many great names among the Oriental, classical, and scientific writers—Champollion, Sylvestre de Sacy, Burnouf, Oppert, Barthélèmy St.-Hilaire, Leclerc, Letronne, Charpentier, Arago, Bernard, Ampère, Milne-Edwards, Flourens, etc. Reviews and journals like the *Revue des Deux Mondes*, the *Siècle*, the *Journal des Débats*, and the *National*, acquired great influence. Literary criticism reached its culminating excellence with Nisard, Saint-Beuve, Girardin, Jules Janin, Prévost-Paradol, etc.

But the most interesting development in letters was the triumph of the romantic school in the domain of poetry and the drama. This mighty movement was led by Victor Hugo (1802–85) (q.v.), the universality of whose genius was astonishing. During his long career he threw off novels, plays, poems, and romances in dazzling succession. Next

to him in genius, though maintaining a somewhat independent attitude, was Alfred de Musset (1810–57) (q.v.), most beloved of all the French poets. Then came Baudelaire, Leconte de Lisle, Sully-Prudhomme, and François Coppée; while, still descending, we have the satirists Barthélemy, Brizeux, Barbier, and Alfred de Vigny, the two Deschamps, and the ultra-romanticists Gautier and De Nerval. Chief of comic dramatists was Scribe (1791–1864), who achieved an extraordinary success. There was some reaction from the drama of Hugo and Dumas the Elder, which was represented in tragedy by Soumet and Ponsard, and in comedy by Augier and Sandeau. Among the novelists Hugo was again first, but he had great contemporaries in the realistic school in Balzac, Mérimée, Flaubert, and Daudet. Naturalism has found its most striking exponents in Zola, Bourget, De Maupassant, and the brothers De Goncourt. The Dumas were prolific and picturesque, and George Sand, a woman of remarkable gifts, wrote passionately at first in her romances, and later with chastened fire and mellowed beauty.

In all its manifestations French literature has ever been the embodiment of the spirit of the time. An unworthy age makes an unworthy people, and susceptible men of genius reflect the national decadence in their pages; happily the converse likewise holds true, and with the growing stability of institutions in France, and the spread of enlightenment and liberty, the national literature can scarcely fall from the high intellectual level it has attained during the past half century.

French Polish, a composition with which furniture is rubbed to give it a smooth and glossy surface. It is obtained by dissolving gum-shellac in alcohol. A rubber of flannel or cotton-wool is saturated with the polish and rubbed persistently against the wood; the polish is thus forced into the pores of the latter. During the process the rubber is usually covered with calico dipped in linseed-oil. When the polish has hardened, it is rubbed with sand-paper before more is applied; but after the two last rubbings no sand-paper is used. Sometimes pumice and linseed-oil are rubbed over the surface after the polishing is complete.

Frequency of any periodic motion means the number of periods in unit time. Thus a seconds' pendulum which exhibits a uniform periodic oscillating motion, takes one second to pass from one side to another, or two seconds to complete the cycle of changes in position. It therefore effects half a period per second, and its frequency is said to be $\frac{1}{2}$. In the case of red light [Colour] the number of oscillations or periods of vibration per second is 4,024 billions, and the frequency rises in the case of violet light to 7,405 billions per second.

Frere, Sir Henry Bartle, Bart. (1815–84), nephew of John Hookham Frere, entered the service of the East India Company in 1833. He did good administrative work among the Mahrattas as Resident and Commissioner at Sattara, and while Chief Commissioner of Scinde he checked the Mutiny by seizing Mooltan. As a member of the Viceroy's Council he helped to re-establish the finances, and was highly successful as Governor of Bombay (1862–67). He was a member of the Council of India for ten years. In 1872 he first went to South Africa, where he negotiated a treaty with the Sultan of Zanzibar which abolished the slave-trade in the interior. Five years later he was made Governor of the Cape, and High Commissioner for the settlement of affairs in South Africa. The scheme of Confederation failed, and the Kaffir and Zulu Wars followed. Sir Bartle's conduct in the last was severely condemned by many statesmen, and when the Liberals came into power in 1880 he was recalled. He spent the rest of his life in literary pursuits, and died at Wimbledon. A monument to him on the Thames Embankment was unveiled in 1888.

Frere, John Hookham (1769–1841), an English man of letters and diplomatist, was born in London and educated at Eton and Cambridge. He entered Parliament in 1796 as a Tory, and to the *Anti-Jacobin* contributed *The Loves of the Triangles*, and a share of *The Needy Knife-Grinder*. In 1799 he succeeded his friend Canning as Under-Secretary for Foreign Affairs. In 1800 he became plenipotentiary at Lisbon, and was transferred to Madrid two years later. He was recalled in 1804, but in 1808 returned to his post. He persuaded Sir John Moore to attempt to hold Madrid, and the unfortunate result of his advice closed his diplomatic career. He now retired to Malta, married, and gave himself up to literature. He produced an excellent translation of Aristophanes, and a biographical work on Theocritus. His works were edited (with a memoir) by Sir Bartle Frere (q.v.).

Frère, Pierre Édouard (1819–86), a French *genre* painter, was born at Paris, where he studied under Delaroche. He made his *début* at the Salon of 1843, and afterwards frequently exhibited in England. In his earlier days he painted artisan interiors, but he is chiefly known by his renderings of child-life. Mr. Ruskin warmly commended him.

Fresco. Fresco-painting is the art of painting on walls covered with plaster in such a manner that the colour and plaster unite and form a single substance. The colours are mixed with lime before being applied, and lime is also the chief ingredient in plaster, so that only those colours can be used which are able to resist its decomposing influence. These are for the most part natural earths. The use of the term "fresco" properly implies that the painting is executed on a freshly-laid surface which is still damp; but the art of painting on dry plaster was also known to the Italians under the name *fresco secco*, so that we must distinguish between this and the "true" fresco (*buon fresco*). Fresco-painting was practised in Egypt at a very early date, and the Etruscans made use of it in decorating their tombs, which were cut out of tufa. Great progress in the art was made by the Romans, as is shown by paintings on walls in Pompeii, but it afterwards fell into disuse, and was not revived till the 12th or 13th century. The early mediæval fresco was *fresco secco*, for the art of painting in true fresco was not discovered till the latter part of

the 14th century. In *fresco secco* the surface was sprinkled with water immediately before painting, and the colours and the wall were allowed to dry together. It is now customary to rub the *intonaco* or final coatings of plaster with pumice-stone as soon as it is dry, and afterwards to moisten it with water mixed with a little lime. The moistening takes place the evening before painting, and is repeated just before the artist sets to work. In *buon fresco* fresh plaster is laid on each time that the artist begins painting, and he is careful to remove any that remains when his day's work is over. Thus in this case the plaster never dries till the painting has become incorporated with it. The first step taken by the artist is to transfer the outline of his design from a cartoon which he has previously prepared to the damp surface of the wall, either by "pouncing"—*i.e.* allowing some of the powder called "pounce" to pass from a muslin bag through holes pricked in the outline on to the plaster—or by actually piercing the design with the blunt point of a stylus. There was considerable variety in the methods of carrying out this operation employed by different artists. When the outline had become implanted on the wall, the artist completed his design in accordance with a small coloured sketch, which he carried in his hand. Fresco-painting necessarily requires great speed, as the drying of the *intonaco* involves fatal results. For this reason the Italian masters were often prevented from finishing their frescoes to their own satisfaction, and added further detail in distemper. Yet there are not wanting paintings—those of Masaccio, for example—which are completed in true fresco, without any admixture of distemper.

Freshwater Herring, a Scottish name for *Coregonus clupeoides.* [COREGONUS.]

Fresnel, Augustin Jean (1788–1827), a celebrated French optician, born at Broglie, department of the Eure. He was the first to construct compound lenses as substitutes for mirrors, and helped to establish the undulatory theory of light by his discoveries and deductions. He was a friend of Arago, and a fellow of the Royal Society ; and his works were published by the French Government long after his death.

Freycinet, CHARLES LOUIS DE SAULCES DE (b. 1828), a French statesman, was following the profession of an engineer when in 1870 Gambetta appointed him to the War Department, where he did much to reorganise the army. In 1876 he was elected senator and was Minister of Public Works under Dufaure and Waddington (1877–79). He was then Foreign Minister and Premier for a few months, and again held that office from January to July, 1882. In April, 1885, he became Foreign Minister in the Brisson Cabinet, and was Premier for a third time when it broke up. He was War Minister under Floquet (April, 1888), and under Tirard (February, 1889). He has published works on engineering, and is a member of the Académie des Sciences.

Freyja, the Scandinavian Venus, was particularly worshipped in Sweden. She was supposed to ride in a chariot drawn by two cats, and to claim half of those slain in battle. The word *frau* (woman) is supposed to be cognate with this name.

Freyr, a Scandinavian god presiding over the weather. His wooing of Gerda, daughter of the giant Geymer, is a leading episode in northern mythology. His chief temple was at Upsala, and his festival was kept at Christmas.

Freytag, GUSTAV (b. 1816) a German novelist and dramatist, was born at Kreuzburg, Silesia. From 1839 till 1847 he was a professor of German at Breslau, and was for many years a journalist at Leipzig. He is the greatest of German novelists, his chief works of this kind being *Soll und Haben* (*Debit and Credit*), a picture of mercantile life ; *The Lost Manuscript*, and the series called *Die Ahnen* (*Our Ancestors*). Among his plays, *Die Journalisten*, is the best known. Freytag was a deputy to the North German Diet, served in the Franco-Prussian War, and in 1886 was made a *Geheimrath* (Privy Councillor) of Coburg-Gotha.

Friar (Lat. *frater*, Ital. *frate*, French *frère*) means "brother," and has been generally used of members of religious brotherhoods. Strictly speaking, friars were members of an order under the rank of priest, the latter being called "father." They are distinguished from monks, who belonged to older foundations, and did not travel about and preach among the people as the friars did. The 13th century saw the rise of the Grey Friars or Franciscans, the Black Friars or Dominicans, and the White Friars or Carmelites, as well as of the Augustinians or Austin Friars. Later also there were the Crutched (Ital. *crociati*) Friars, or Trinitarians. In England the friars were not only founders of schools of theology, but also the leaders of the people in political matters during the Barons' War. Their political songs are the first rough expression of democratic theory in English literature. In the 14th century, however, they became rich, and soon lost their influence. Their principle of mendicancy and interference with the parish priest were attacked by the monks and regular clergy ; and Wyclif, while agreeing with them in these matters, was opposed to the orthodoxy of their doctrine. They in return became the enemies of the Lollards. The degeneracy into which the friars had fallen appears from the description given of them in the *Vision of Piers Plowman* (end of 14th century) and in the *Canterbury Tales* (Prologue). Dr. Jessopp's *Coming of the Friars* gives an interesting account of them.

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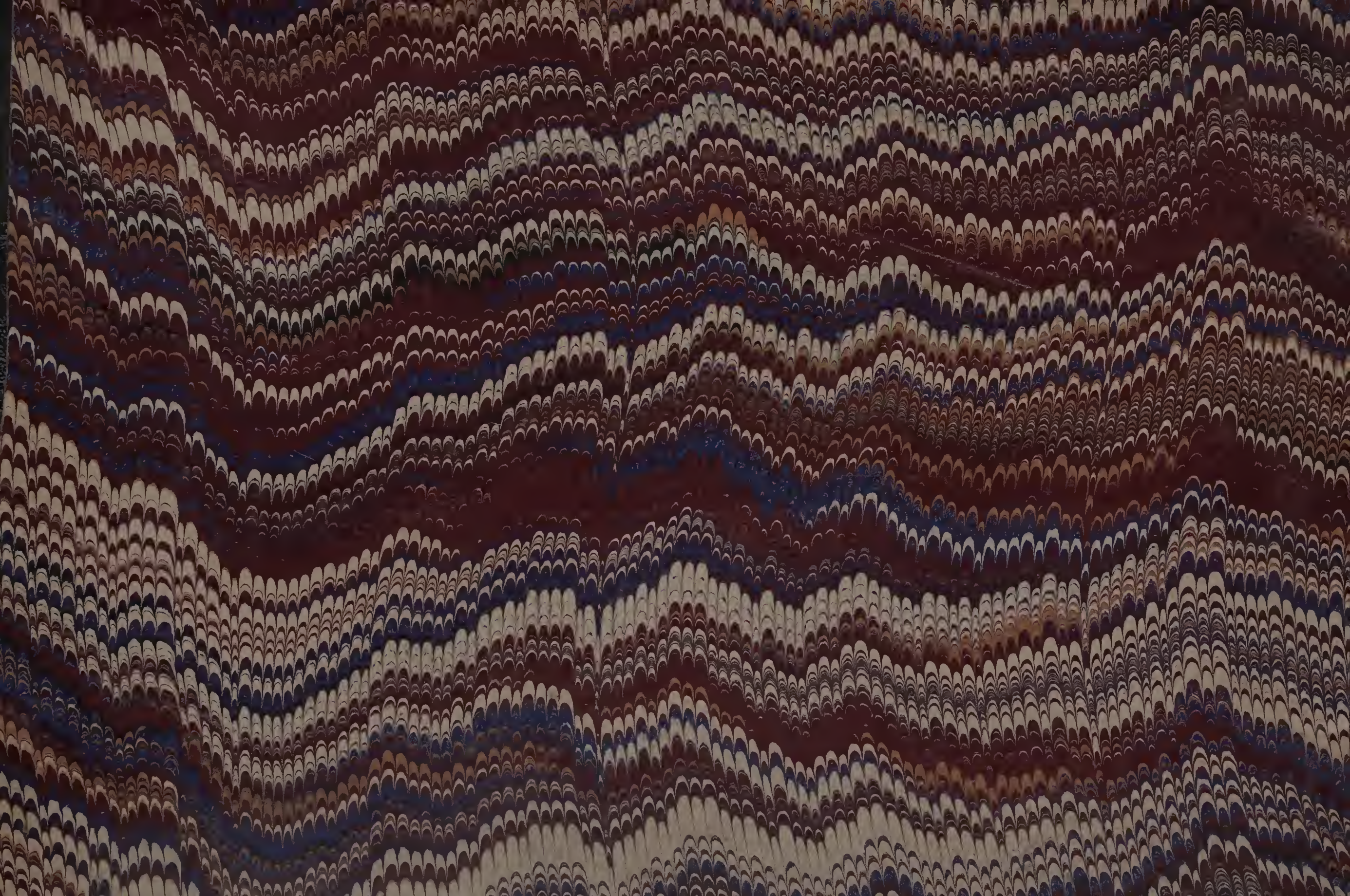

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